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Europe/Latin America Report

SCIENCE AND TECHNOLOGY

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Effective 1 June 1987 JPRS reports will have a new cover design and color, and some reports will have a different title and format. Some of the color changes may be implemented earlier if existing supplies of stock are depleted.

The new cover colors will be as follows:

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SOVIET UNION.............salmon
EAST ASIA................yellow
NEAR EAST & SOUTH ASIA...blue
LATIN AMERICA............pink
WEST EUROPE..............ivory
AFRICA (SUB-SAHARA)......tan
SCIENCE & TECHNOLOGY.....gray
WORLDWIDES...............pewter

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EUROPE/LATIN AMERICA REPORT

SCIENCE AND TECHNOLOGY

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NEW TECHNOLOGY DIRECTOR AT AEROSPATIALE INTRODUCED

Paris L'USINE NOUVELLE in French 8 Jan 87 p 26

[Article by Jean-Pierre Casamayou: "Claude Terrazzoni: A Pilot in the Factory"; first paragraph is L'USINE NOUVELLE introduction]

[Text] To increase productivity and to consolidate the work of various aspects of the aircraft division: two objectives of the new technology director.

For Claude Terrazzoni the year begins with a new responsibility. Since last week this 51-year-old graduate of the Advanced Aeronautics School is the new technology director of Aerospatiale's aircraft division, a real company with 13,600 employees and four plants. As number two man behind Jacques Plenier, he is directly responsible for the research department and for flight testing, involving a total of 2,000 technicians, pilots, and engineers, who are the brains of the division.

Of course you can easily imagine this former test pilot having a preferance for flight testing and the 300 people ensuring the first flights of Aerospatiale's aircraft, because with 5,200 flying-hours to his credit, Claude Terrazoni still has a passion for flying--a passion he wants to share with his engineers. "I offer my staff 25 flying-hours," he affirms. "For me it is fundamental that those who design the aircraft should also have a feeling for the air."

The technology director, who is above all an engineer, will first of all make sure that the Blagnac research department remains one of the best in the world. The proof: The cockpits developed for the new Airbus and the Hermes space shuttle have already been copied by Boeing and McDonnell-Douglas. Nowadays it is not enough to be a good designer. You also have to manufacture and sell the aircraft. In that respect the French company's situation does not compare to that of its American competitors.

Although the A-320 is selling well, sales of the larger--and most profitable--carriers and of the ATR-42 are stagnant. Moreover, the launching of the A-330 and A-340 will require new investments, a difficult step for Aerospatiale. "Financially, this is not a good time for us," Claude Terrazzoni admits. "If we want to be able to meet competition, we absolutely must lower production costs."

Thus, the technology director's first goal is to increase productivity. To do so, he will continue efforts already begun: the spread of CAD up to the production stage and greater specilization of the division's four plants, whose further automation will unfortunately have consequences on employment and lead to the disappearance of certain types of positions. But economic realities have changed. How can you fill an order for 100 A-320's when production is already sold out until 1993? How can you make a profit from a production line designed for five planes a month, when it only produces two and one-half? These are questions Claude Terrazzoni will have to answer.

The other part of the aircraft division's technology director's task will be to consolidate the work of all the various departments, uniting production, marketing, and finance in one "operational group" for each type of aircraft. This task is made easier by the fact that the technology director comes from the outside. A weapons engineer for the Aeronautics Technology Service, he has only been with Aerospatiale for 3 years. This can only help him to break with the old habits of the house. For Claude Terrazzoni will have to be more occupied with the company's future than with its internal quarrels, if he ever hopes to oversee Aerospatiale's success.

25039/12951
CSO: 3698/A121

CROUZET DEVELOPS SENSORS, NAVIGATION AIDS

Paris L'USINE NOUVELLE in French 2 Jan 87 pp 18-19

[Article by Jean-Pierre Casamayou: "Crouzet in the Battle"; first paragraph is L'USINE NOUVELLE introduction]

[Text] MAD detectors, voice controls, navigational computers..., the military contractor is fighting on all fronts and depends on his front line technologies.

A tough contest is currently under way in England for Crouzet's aerospace and defense division. In a few weeks the Royal Navy will choose between Crouzet and one of its North American competitors--Texas Instruments or Canada's CAE--to equip its antisubmarine helicopter fighters with magnetic anomaly detectors (MAD). The stakes are high for the Valence-based company because success could lead to a shower of other orders. First, from the Americans, who have just tested Crouzet's MAD for their Lockheed P3C and are to test it on their helicopters in early 1987. Next, from the Scandinavian countries, concerned with better detection of Soviet submarine incursions in to their fjords, and, in general, from all the countries which use the P3C. "Extraordinary possibilities," declares Francois Theveny, director of the aerospace division. "This detector is ready at the time of greatest demand."

Crouzet's MAD is indeed better than the competition. The fruit of collaboration with the LETI [Laboratory for Electronics and Data Processing Technology] of Grenoble, this detector illustrates the manufacturer's strategy: priority to high technology (in this case, nuclear magnetic resonance and electronic pumping) with close laboratory-industry cooperation. Another success: voice control for armored vehicles and aircraft developed with LIMSI [Data Processing Laboratory for Mechanics and Engineering Sciences]. These results are due to the R&D effort (12.5 percent of turnover) and to recruitment (a 35-percent increase in the number of engineers over 5 years).

Even Crouzet's oldest speciality benefits indirectly from new technologies. After pressure and flow sensors, Crouzet is going into ultrasonic flow meters for cryogenic fluids and quartz and silicon sensors. Production of about 5,000 per year is intended primarily for the aerospace industry, but also for the oil and nuclear industries, which work in similar harsh conditions. In addition to its work in sensors, Crouzet is strengthening its efforts to create an efficient microelectronics department (200 employees).

"Our combination of skills is unique in Europe," affirms Jean-Claude Chanteur, the department's marketing director. "We are capable of analyzing components, proposing a technology (gate array or standard cell), and then assembling it, thanks to our expertise in microconnections on composite quartz or silica fiber substrates." Crouzet produces all the circuits for its own products and offers its services to outside parties.

Strengthened by these new tools, the group headed by Roger Champt is reinforcing its primary activity: on-board computers (100 kg of electronics are in orbit on SPOT).

Crouzet is also betting on hybrid navigation systems, for which it has become the European specialist. These are systems which combine several navigational methods. Doppler radar, inertial units (SFENA's [French Company for Air Navigation Equipment] qyrolaser, radioelectric means (Omega), and the pitot-static system developed by its subsidiary Badin. Moreover, in order to be present on all fronts, it is using its stockholders' equity to develop a hybrid system with tracking by Navstar satellites.

A risky move, since the governmental bodies have chosen its competitor, TRT [Radio-electric and Telephone Telecommunications], to equip military aircraft. Crouzet can only count on exports and the airliner market. However, it still has its on-board computers (all military aircraft have a Crouzet) and the navigation systems for armored vehicles and artillery, which do not yet have any competitors. "Our great strength lies in being present in the weapons systems of the three armies [the army, the navy, and the air force] and in space," concludes Francois Theveny.

25037/12951
CSO: 3698/A112

EUREKA PROJECT TO APPLY AI IN ISDN NETWORKS

Paris INTELLIGENCE ARTIFICIELLE in French Feb 87 p 2

[Article: "EUREK'IA: The Projects Approved in Stockholm"]

[Excerpts] We list below the AI-oriented Eureka projects approved during the mid-December ministerial meeting in Stockholm.

OASIS: Security and Versatility of Open-Ended Networks

The OASIS project, one of the most important approved in Stockholm, is premised on the generalization of ISDN networks in Europe by around 1995. Based on this view, OASIS is targeted on developing the standards and products relative to four key elements of these future networks:

--Definition of the characteristics of the general-purpose intelligent workstations that will be connected to these networks. Emphasis is placed on the development of security systems that screen the accessing of the data locally stored in the workstation.

--Definition of the standards and physical components that will ensure the security of the data while transiting the networks.

--Definition of a refined typology of the applications that are to transit the open-ended networks (technical characteristics of the messages, total flows, security requirements), a typology permitting optimization of the characteristics of the hardware and software components of the future networks.

--Definition of the standards and languages for managing and querying the databases stored in the information retrieval systems, the emphasis here, as well, being on the security and user-friendliness of these systems.

In this megaproject, artificial intelligence is to be applied at several stages:

--The workstations are to include a "natural-language-comprehension" component and tools of the expert-system type to assist the user.

-- The security of open-ended networks will probably require ciphering algorithms of a new type using AI techniques.

--The system of management of the databases, and the standardized languages to be used for querying them, must concretize the convergence between present relational database management techniques and the organization of AI-oriented knowledge bases.

The OASIS project is being headed by the German data processing builder Nixdorf. British Telecom, Cap Gemini Sogeti, Philips, and Standard Electric Lorenz will participate in these developments. Notably, the AI component of the research to be done under OASIS will be provided primarily by two French laboratories: The IIRIAM [International Institute of Robotics and Artificial Intelligence at Marseille) and the LIFIA [Fundamental Data Processing and Artificial Intelligence Laboratory]. The IIRIAM will be primarily responsible for the development of AI applications to network management; the LIFIA will be responsible for AI applications to user-interface, error-detection-and-correction, and protocol-specifications problems.

The overall cost of the OASIS project is put at 92 MECUS (or around 640 million francs), of which 20.7 MECUS will be devoted to developing the characteristics of workstations, 16 MECUS to open-ended network security problems, and 45.6 MECUS to the defining of the optimal characteristics of general-purpose networks and to the defining of database management standards.

The breakdown of these costs by countries is to be: Austria 10 percent; Great Britain 15 percent; Netherlands 10 percent; France 20 percent; Federal Republic of Germany 30 percent; and Switzerland 10 percent.

9399
CSO: 3698/364

FEB 1987 STATUS OF ALVEY 'LARGE SCALE DEMONSTRATORS' IN UK

Paris INTELLIGENCE ARTIFICIELLE in French Feb 87 pp 4, 5

[Excerpts] In our preceding issue we reported in considerable detail on the developmental work being done in Great Britain under the Alvey program. Space limitations, however, precluded our discussing the four projects termed "Large Scale Demonstrators." These projects are nonetheless of unmistakable interest: They were undertaken in an endeavor to converge all the research being done under the Alvey label into concrete, commercialized realizations. After 2 years of activity, this convergence appears on the verge of achievement; however, the integration of the ongoing research on VLSI continues to pose problems. Besides providing a very interesting illustration of the complementarity of the developmental work being done on expert systems, man-machine interfacing, and VLSI components, these large scale demonstrators may also have the merit of clarifying certain "sociological" aspects of the introduction of expert systems. Thus the DHSS project [not excerpted], the aim of which was to develop better control of the apportionment of different social services, has stirred wide-ranging debate.

Expert System to Aid in Design of Mechanical Parts

This project, labeled "Design To Product," is headed by the Electrical Projects Division of the GEC. Participating in it are the Universities of Edinburgh, Leeds and Loughborough; the National Engineering Laboratory; and the Lucas firm. Its aim is to apply the techniques of expert systems and intelligent man-machine interfacing to a tool for designing mechanical parts. The data issuing from this intelligent-CAD phase is then to be directly reusable in all phases of the manufacture and maintenance of the product. This project is very similar in concept to the Eureka project being headed by Aerospatiale.

The total budget for this project is 8.9 million pounds, the allocation of which is divided into two phases. The first phase, which began a year and a half ago and which has still another yearto run, is a definitional phase; the second, which is to extend over another 2 and 1/2 years, is expected to bring the operational tool into being. During the pilot phase which is to end in September 1987 [as published], the overall architecture of the system

and the specifications of its components have been defined. The latter will be six in number: the CAD system strictly speaking; the system for generating the necessary machining data from the output of the CAD tool; the machining operations management system; two assembly operations management systems; and a robot-calibration system to be installed on the production lines. The sum total of these developments is to be concretized by the installation of a new plant for the manufacture of public works equipment by the Lucas CAV firm, at Gillingham, in March 1990. This plant will be designed entirely in conformity with the "Design To Product" system.

Speech Input Word Processor and Workstation [SIWP] Project

The SIWP project is undoubtedly the best-known of the Alvey projects. Its aim is the development of software and hardware for the word processing of speech inputs.

The current prototype-development phase has produced an initial speech-recognition machine which will be the core of the complete system. This prototype utilizes a Xerox workstation and is written in InterLisp language. It is presently capable of recognizing a vocabulary of 5,000 words, of analyzing the syntax of the speech input, and of offering the user, in the event of a doubt as to interpretation of that input, the most probable written versions of the phrases voiced.

This system is currently being evaluated. Work relative to the user interface was initially oriented on displaying the results recorded by the machine and on intervention (also vocal) by the user with regard to these results: All the classic word-processing operations (erase, move, underline, insert, etc.) must thus be executable via speech input. These developments are also all written in Lisp. It appears that the project is expected to encounter no further major difficulties from the technical standpoint. The problem that remains, however, is that of realizing, a speech input processing workstation at a cost that is competitive.

Mobile Information System

This "demonstrator" is headed by the Research Division of the Racal firm. Participating in it are the Universities of Cambridge and of Sussex; Thames Polytechnic; Ferranti Electronics; and Plessey Controls.

The aim of this project is to introduce information processing systems aboard mobile vehicles (private automobiles, common carrier vehicles). The project was initially divided into five complementary subprojects:

1. Development of a cellular radio system for interconnecting vehicles with the telecommunications network. Artificial intelligence is applied here to the development of user interfacing that will permit the user to send and receive information without having to stop his or her vehicle.

2. Development of a system designated MEO [Mobile Electronic Office] that provides for installing intelligent terminals aboard vehicles to operate as onboard work stations.

3. Development of a system for the automatic processing of radio communications relative to vehicular traffic and accidents: Messages sent by local police stations are to be automatically processed and transformed, if necessary, into radio messages broadcast to all motorists. (We note that the Cimsa-Sintra firm in France has undertaken similar developmental work in connection with the processing of communications emanating from a military field of operations.)

4. Development of a system for diagnosing troubles in electrical installations powering the telecommunications network that carries the cellular radio system.

5. Development of a system designated "Locator" for providing motorists, at any and all times, the position of their vehicle, as well as information (map information, for example) relative to the zone in which they happen to be at the time.

After 2 years of research and evaluation, certain components have been redefined: The navigation system (identification, at any and all times, of the geographical position of the vehicle) has been abandoned, since commercialized systems of this type already exist in Japan and the United States; moreover, the amount budgeted for the project will not suffice for the development of a similar radio network on a nationwide scale. The concrete developmental work undertaken over the next few years will center on components number 3 (automatic processing of radio messages relative to traffic) and number 2 (onboard workstation).

9399
CSO: 3698/364

BRIEFS

FRG:CO_2- LASER ON EXHIBIT--The power requirement for gas circulation in carbon dioxide lasers can still be substantially lowered. In a new development by the Lasertechnik GmbH firm in Heusenstamm a radial blower is used which is positioned coaxially to the axis of the laser resonator and takes over the task of transporting the laser gas through the discharge tube and the gas cooler. Conventionally high-performance carbon dioxide lasers are operated on the principle of fast axial gas exchange. But the Roots blower used in that system operates usually as a displacement pump. To overcome the high flow resistance in the gas conduction lines in the gas cooler and in the laser tube it is necessary to use very expensive blowers whose power consumption can range between 5 and 10 kw--in the opinion of the Heusenstamm company. Using the new system devised by this company one can get along with a motor power of 300 watts, and this even includes the losses in the frequency converter. The blower is driven by a high-performance AC motor at 20,000 rpm. To secure minimal bearing friction gas bearings are used which are operated with the laser gas under a pressure of 5 to 6 bar. The laser is supplied with an operating frequency of 13.56 MHz. Through this type of excitation it is possible to achieve very high power densities in the laser tube without quality degradation in the laser beam. High-frequency excited lasers are claimed to be simple in their mode of operation, especially in pulse operation. The new laser source is said to be designed for an output power of 1 to 1.5 kw. The manufacturer also claims that if a higher power is desired then one can place several resonators of identical power in series in a modular construction. The laser is expected to be exhibited at the Hanover Industrial Fair with a laser processing system produced by the Held Special Machines Co., Inc. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 20 Feb 87 p 7] 8008

CSO: 3698/355

SGS OF ITALY PLANS 1987 SEMICONDUCTOR STRATEGY

Paris ELECTRONIQUE ACTUALITES in French 20 Feb 87 pp 1, 14

[Article by P. S.: "SGS Wants a Larger Share of the Semiconductor Market in 1987"]

[Excerpts] The Italian semiconductor company SGS Microelettronica is counting on a 25 percent increase in sales (expressed in dollars) for 1987, which is once again a growth greater than that of the market. For 1986, SGS experienced an advance of 23 percent whereas that of the world market was only 20 percent.

Commenting these figures, Mr Longoni, vice president of the company and general manager for Europe, emphasized that in a period of crisis such as that occurring worldwide in the semiconductor industry it was imperative to increase its market shares. The new strategy being pursued for 6 years at SGS allows not only attaining this result, but also consolidating it from year to year, Mr Longoni pointed out, which should finally permit reaching a financial balance, probably at the end of 1987.

Without the wayward effects of the dollar exchange rate, SGS would probably have balanced its accounts in 1986, the year in which its losses are in the neighborhood of $40 million.

Expressed in dollars (which is unanimously allowed in the profession, although that does not necessarily reflect the real activity) the SGS results for 1986 show worldwide sales of $375 million, up by nearly 23 percent. This is the sixth consecutive time that the company has increased its percentage.

Near the Customers

For 1987, Mr Longoni expects that his company will make 18 percent of its sales with new products in the consumer goods, telecommunications, and automobile sectors. And this without any appreciable modification of the 1986 balances among the large market segments served by SGS. Last year, SGS divided its revenue into 41 percent on the consumer goods and automobile markets (against 51 percent in 1980), 17 percent on the military and telecommunications markets (compared to 14 percent in 1980), 16 percent on the data processing markets (compared to 9 percent in 1980), and 26 percent on the industrial and distribution markets.

The following technological categories were dominant: In 1986 at SGS, bipolar circuits represented 50 percent of the activity (44 percent in 1980), for 29 percent in MOS circuits (16 percent in 1980), and the discretes took 21 percent (whereas they had 40 percent in 1980).

For Mr Longoni this distribution has only a secondary value. The main point is the technological aptitude to reply to the users' requirements, even mixing the technologies to suit the circumstances.

Mr Longoni attributes the 6-year SGS growth to its adaptation to these requirements by reason of its strategic organization.

Thus, explains Mr Longoni, this organization allows great flexibility in providing custom circuits by adopting appropriate technologies each time. "This strategy, near the customer, has facilitated our growth; it should give its full results when the market again exhibits a strong advance."

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CSO: 3698/338

FRG FIRM DEVELOPS HIGH-PRECISION TESTING FOR CHIPS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 2 Mar 87 p 7

[Article: "Leitz Increases Measurement Precision in Chip Testing--Precisely Adjusted to a 20-Millionth of a Millimeter/Ultrasonic Microscope Improved"]

[Text] In order to be able to place suitable optical testing instruments in the hands of chip manufacturers, who after the 1-megabit chip are already aiming at the 4-megabit version, ever more precise devices must be developed to detect and evaluate ever more minute structures. The firm of Ernst Leitz Wetzlar GmbH expects that by the year 1990 16-megabit chips on a silicon base will be in mass production. They consider that it will also be necessary to reckon on the likelihood that structural breadths which are today already less than 1 micrometer (a thousandth of a millimeter) will be still further reduced. Leitz has already created measuring and inspection systems which go distinctly below these magnitudes. According to data provided by the manufacturer the measurement precision is around 20 nanometers or, in other words, around a 20-millionth of a millimeter.

The Wetzlar firm is now introducing the mask measurement machine LMS-2000 onto the market. It is said to measure with four times as much accuracy as any previously known system. The adjustment as well as the measurement of masks in sizes ranging from 3.5 to 9 inches is accomplished automatically with the actual measuring being done optically. In order to achieve these values from a measuring machine working with a precision of less than 30 nanometers a climate chamber was developed in which temperature variations are maintained at a maximum of ±0.05° C, according to Leitz. Likewise in the new Alpha Eximer laser for ablation of photolacs on alignment marks a superposition precision better than 0.05 micrometer (or three sigma) is achieved. In this the company has the advantage of cooperation with its American partner Leitz-IMS (Image Micro Systems), Boston. For the LMS-2000 the Boston company contributed the control electronics and the user software.

Also employed are the already available system components of the Ergolux and of the LIS with the LTM contamination-free transport system. Leitz has likewise further developed the Elsam ultrasonic microscope which can be used for nondestructive examination of semiconductors. This has been further extended by one low-frequency unit for 100, 200, and 400 MHz in order to extend penetration depths into all materials and metallic films by several hundred micrometers.

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CSO: 3698/355

BRIEFS

SIEMENS BEGINS 1-MBIT DRAM PRODUCTION--Siemens has started to manufacture 1-Mbit 1.2 μm CMOS DRAM chips within the framework of its "Super-Chip" program. According to the company the production cruising speed would be reached next summer. However, it has not been possible to have the present production figures. This production is the result of cooperation with Toshiba which permitted speeding-up the installation of the production lines. Thus, the schedule was adhered to; and the Regensburg (Bavaria) manufacturing plant, which cost DM600 million, is now operational. Siemens has not spared the expenses since DM2.5 billion have been invested in the project (800 million in research and development, and 1.7 billion in equipment). And, in addition to the Regensburg site, the West German firm has installed a research laboratory at Munich-Perlach, also at a cost of DM600 million. In all, Siemens has engaged 1,350 employees in this technological battle. At Munich-Perlach alone, 390 persons, including 300 scientific specialists, are performing research on the future 4 and 16 Mbits. [Excerpt] [Paris ELECTRONIQUE ACTUALITES in French 20 Feb 87 p 15]

13112/12947
CSO: 3698/338

BRIEFS

FRG TECHNOLOGY CENTERS--In the German technology centers which were operating in December 1986 a total of 628 enterprises are at work with about 3,860 workers employed on a floor area of almost 300,000 m^2. A good 3 years after the opening of the first technology park in Berlin there have been present in February 1987 as many as 40 of these centers throughout the FRG. At least two additional ones are expected to be set up this year. Most of the centers are located in North Rhein-Westphalia (11), Baden-Wuerttemberg (9), and Lower Saxony (9). At the tail end of the parade are Bremen, Berlin, Hessen, and Schleswig-Holstein with one founder park each. The focal points of the regional centers have been described in a review of German technology centers and founder centers produced in cooperation with the Technical University of Berlin ("Technology Centers in the Federal Republic of Germany 1987," Innovation and Management Series, Vol 9, Weidler Buchverlag, Beusselstrasse 86, 1000 Berlin 21). There is a strikingly large number of innovative firms active in microelectronics, with the number of software enterprises easily exceeding the number of hardware manufacturers. But technology parks also attract in large measure young enterprises in the area of laser technology or in measurement technology or control technology and servotechnology. In examining individual parks certain regional emphases are clearly discernible. Two examples of this are biotechnology and medical technology in Heidelberg or manipulation technology and automation in Dortmund. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 16 Mar 87 p 7] 8008

CSO: 3698/355

HUNGARY: VEGA PROGRAM EXPERIENCE AIDS COMPUTER DEVELOPMENT

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 pp 1, 3

[Article by Attila Kovacs: "After the Vega Program"]

[Text] The Vega program which ended last year and caused a world sensation made the name of the KFKI [Central Physics Research Institute] known even to those thus far untouched by peak technology. The spectacle transmitted to Earth by the Vega probes was very largely due to the Hungarian researchers. The special hardware and software of the TVS on-board TV system perfectly performed its form recognition, orbit prediction, high sample density, real-time image processing tasks. The experience obtained is being put to use in the further space projects of the institute. They are already preparing the on-board computer for the landing unit of the Phobos space probe to be launched within 2 years. This probe, also being built with international cooperation, will visit Mars and one of its moons.

Janos Szlanko, scientific director of the Measurement and Computer Technology Research Institute of the KFKI, reported on the most recent achievements within the framework of users' days.

They have prepared a computer with model designation TPA-11/580. Manufacture of it will begin this year and a few systems will be sold on the domestic market by the end of 1988. In recent months they prepared a 4 M byte storage module for the TPA-11/540 computer which appeared earlier; with the aid of this module the physical memory size can be a maximum of 16 M bytes. By replacing the so-called mounting box containing the central unit and memory they can transform the already operating TPA-11/40 and TPA-11/48 systems into a significantly more powerful system designated TPA-11/428 (about three times more powerful compared to the processor of the 48). New software prepared for the TPA-11 computers includes the DOS-RV-PLUS V3.0 operating system, a further development of the V2.1 version. The BASIC-PLUS-2 V2.3 compiler program is replacing the BASIC-PLUS-2 V1.6 compiler program. The SORT/MERGE V3.0 sorting and merging program is successor to the V2.0 version. The MOS-VP/FORTRAN compiler program is a somewhat further developed version of FORTRAN 77 and the MOS-VP/PASCAL contains expansions compared to the ISO standard.

With the aid of the MOS-VP/NET system the members of the TPA-500 computer family can be linked into a uniform computer network; the TPA-11/400 and TPA-11/100 computer families can also be members of this network.

They have introduced purchase discounts for the TPA-Quadro machines, which can also be obtained in leasing arrangements. The leasing time is 40 months, during which one must pay as rental fees 163 percent of the original purchase price (28 percent at the time of taking over the machines). The discount is 10 percent on the basic machines when buying three or four Quadros and 20 percent when buying five or more. Up to 31 January they will count in the old TPA-8 machines turned in by Quadro customers.

8984
CSO: 2502/25

HUNGARY: REGULATOR EASEMENTS FOR CAD/CAM, ROBOT, ELECTRONICS ACQUISITIONS

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 3

[Text] Several concessions and preferences were introduced in the regulator system at the beginning of the year in connection with the central economic development program for electronics.

Among other things they modified a provision which greatly hindered software trade; it is still necessary to stockpile software products but they do not have to be taken into account when setting up permanent stockpiles.

It is no longer necessary to pay a turnover tax when purchasing or leasing software.

According to what is contained in Appendix No 2 of Ministry of Finance Decree No 40/1986 (X 31) PM (MAGYAR KOZLONY, No 46) beginning 1 January 1987 one does not have to pay a wage tax on author's fees paid for works falling under copyright protection--thus, for example, for software.

According to Appendix No 4 of the same decree the acquisition of tools (including CAD/CAM work stations, local networks, flexible manufacturing cells, etc.) serving to bring in new electronic technologies can be exempt from the accumulation tax--on the basis of a competition.

The types of products which can be purchased at the expense of the technical development fund have been expanded by, for example, CAD/CAM systems, intelligent measurement devices and certain program development systems.

The duty suspension prescribed by Ministry of Foreign Trade and Ministry of Finance Decree No 3/1986 KKM-PM for the second half of last year for a significant number of electronic and robot technology products will remain in effect this year--with minor modifications.

The Education Ministry will get a simple duty rebate on parts for school computers obtained centrally from the domestic market.

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HUNGARY: SZTAKI DEVELOPS OWN MOUSE

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 3

[Text] The mouse controlled iconographic menu technique introduced for the first time in the world of PC's played a significant role in the success of the Apple Macintosh. The palm-sized device more reminiscent of a cigarette box is now an organic part of more and more modern microcomputers. When the first Hungarian developed mouse appeared recently as an accessory for the Pharos intelligent graphics terminal of the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] it was immediately evident that in form and size it deviated from its famous brothers. It is a 110 mm diameter hemisphere under which the designers put not only the electromechanical transformer but also electronic storage and processing circuits and an RS 232 serial interface. This solution is contrary to that of most mice, where the interface is in the computer, on a separate card.

The new peripheral belongs to the second generation; it has a built-in microprocessor. One can find three push-buttons on it, with which one can select different functions on the screen depending on the task (e.g., implementing the function of the given point or icon, moving an object, etc.). Moving the mouse on the desktop the ball in contact with the desktop and serving as a base for operation transfers the movement to two code disks, from here photodiodes sense the number of unit movements. These values are recorded by counters connected with the single chip microcomputer. The simple microprocessor interprets and processes the movement values and sends the information to the computer via the interface.

With this pointing device one can control the screen in a substantially more modern way than from the keyboard. A non-digitizing input peripheral providing rough coordinates can be used primarily where the user is employing a more modern menu technique. In order to use a mouse for the computer one needs primarily a very good resolution graphics display.

"It is useful to connect a mouse to monitors with a resolution of 640 x 480 pixels," says Pal Verebely, the father of the Pharos. "The device developed at the SZTAKI can help primarily in CAD systems and in electronic publishing activity, but also in any application where the user is working in several windows at once and must move very quickly among windows. I can also imagine the mouse as an independent product; naturally one must always write the supporting software."

"The reason that the use of a mouse with professional microcomputers has not spread here so far I see in the fact that in Hungary menu software and especially the iconographic menu technique have no serious tradition in general," says Istvan Korosi (Budapest Technical University).

Hopefully the appearance of the Pharos mouse will play a pioneering role in making broader use of the advantages of this technique here. To do this the hardware and software components of domestic microcomputers will have to be modernized further, and there must be more applications which require use of the possibilities offered by the mouse.

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HUNGARY: FINDINGS OF NEUMAN CONGRESS MIXED

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 4

[Article by Marton Vargha: "Applications '86; The Neumann Congress"]

[Text] The participants at the congress met for 4 days. At the plenary session on the first day we could here how the representatives of the responsible ministries and offices saw the present and future role of computer applications in the economy. On the second and third day papers were read at four sites on realized and planned applications and on the status of computer technology education. On the last day they again held a plenary session at which the section chairmen reported on the work and generalizable lessons of the sections--foodstuffs economy, industry, health, commerce, finance, general informatics and education.

In his opening speech Tibor Vamos, honorary president of the association, outlined the domestic state and status of computer technology in a resigned way. Referring to previous Neumann congresses he said that we cannot brag of stable results in any of the three main areas--device manufacture, basic software preparation and applications. In device manufacture we have gone to the import of Taiwanese professional personal computers; in the area of basic software we have succeeded primarily in producing products difficult to reproduce which can be sold in one or two copies; and in applications the systems which might be sold as products on the world market are late. Tibor Vamos emphasized that there is great need for associations which will produce useful results in the future, and that the Neumann society might undertake an important role, as a metaorganization, in establishing these.

Talks were given at the plenary session by Laszlo Pal, on behalf of the OMFB [National Technical Development Committee], by Peter Reiniger, on behalf of the Ministry of Industry, and by Gabor Udovecz, on behalf of the Secretariat of the Council of Ministers. It appeared from their talks that the domestic development of computer technology has come to a halt and that the backwardness compared to the rest of the world is increasing. Expansion of the computer park--and the ever more urgent renewals--must be solved primarily with equipment which can be obtained within CEMA and which represents the technology of the 1970's (naturally we are not talking about microcomputers here). There is anarchy on the market for computer peripherals; demand cannot be satisfied at a fair price, in good quality or with acceptable time limits.

Applications, making use of computers, is held back by the unclear nature of authors' rights for development software. Automation, building computer technology into technological processes, is slower then it should be.

The speakers counted the teaching of computer technology and the manufacturing culture which has developed in computer technology device manufacture as unambiguous achievements. About 7,000 people work in the manufacturing industry. The per capita production value in this branch is 1.5 million forints per year, three times the industrial average. (It is true that here one must also consider the price generation distortions.) It is thought provoking that at the same time only 2 percent of the investment goods go here.

Despite the troubles and problems, computer technology--together with intellectual work--figures as a balm, as one of the chief tools for fulfillment of the prescriptions of the Seventh 5-Year Plan. The plans count on fewer raw material and energy sources, and so assign a stressed role in increasing the production of national income to increasing the efficiency of intellectual work and to computer technology--a little more comprehensively, to informatics.

Talks were given at four places on the second and third days. Those who decided which talks to listen to on the basis of the titles were most attracted to Ferenc Roman and Mrs Gabor Szorenyi and chose them. Some had to stand to listen to their report ("System Organization at the Other End of The Vienna Highway") which was full of turning points and started with an introduction to the organization of systems organization. The basic tools for industrial type software preparation are not lacking there. They had to begin their work by studying a thick handbook in addition to learning the operating system of the computer--a Bull Mini 6. This handbook was the house standard of the Bull firm, with obligatory rules for documentation, handling errors and program writing. The task was creation of a commercial information system operating in a network; the speed in tracking the changes required simulation optimization of data recording even while organizing the system. The end of the story was worthy of the title. By the time they finished programming the customer reneged on the contract. A competing firm had delivered a complete system in 3 weeks.

The talk by Andras Matay about a computerization, automation program started--and in part already realized--at the Lampart Chemical Industry Factory was instructive. I was taken by the profit already shown, the size of the idle inventory and incidentals discovered by computerized record keeping--totaling 100 million forints.

In their talk Laszlo Fero and Geza Allo described the Viking image processing system, the result of several years of developmental work. This device is based on an ESZ [Uniform Computer Technology System] 1011 computer supplied with an auxiliary processor and it serves to digitize and analyze television pictures. The development was done on order, but this system satisfies the requirement which the organizers of the congress made of the applications, that they can be used widely and can be sold as a product. The goal set before

the Viking was to recognize valuable metal lumps lying on the bottom of the sea through pictures taken with an automatic camera. The accentuation, analytical procedures which they built into the programs could be used in other applications--such as medical and military ones.

In their summaries the section chairmen noted many interesting ideas and criticisms wothy of further thought. There may be a need for user clubs, organized meetings for those working with more widely used software. Peter Kovacs recommended the development of a new sort of structure on the basis of a new ordering principle because, as he said, the present special department structure is too rigid, too formal, and it is difficult to breathe life into it.

Pal Nemeth--who chaired the most varied section for 2 days, the general informatics section combining talks from many places--gave a critique of the style of the lectures and comments which is worthy of consideration. The talks lacked the historical element, a formulation of the problem or task, a perusal of the possible solutions and a justification for the path chosen. And he criticized the audience for excessive politeness, saying that sharp professional debate was useful.

Peter Vadasz gave a talk in the general informatics section titled "PC Problems, PC Joys." Pal Nemeth saw lessons in the sharp debate which followed, that there is obviously a need for an analysis of the place of the profession, of the some 30,000 experts, in society, in the area of both their tasks and the recognition given them. Certainly the Neumann society must deal with this, with special regard to the spread of personal computers, which seems to be forcing those working on large computers into the background.

Balint Domolki felt that there were too few talks which reported on applications made up of existing software tools but, he said, it was gratifying to find in the talks that the use of computers is already built indispensably into everyday practice. As he quoted from one of the lectures:

"... The machine was down for one day in the 8 months and when they had to go back to working without the computer the lady in charge of our machine publishing, who has worked in the institute for 36 years and is about to retire, chastised us as follows: You know, boys, how I disliked and feared this machine and the new system, but dammit, when will you get it up again, one cannot work like this."

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HUNGARY: REPORT ON '86 CHEMOMETRICS SEMINAR

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 6

[Article by Gabor Veress: "Kemometria '86"]

[Text] Chemometrics is a new branch of science embracing the chemical, analytical chemistry and chemical industry applications of chemical measurement theory, mathematics, systems technology and computer technology, thus the material discovered and systematized by it is the basis for the electronification of chemistry and the chemical industry.

The Kemometria '86 seminar was part of a traditional series of programs; every fall since 1983 there has been a meeting of the "chemometers," the domestic experts interested in the new branch of science.

One of the chief themes of the seminar was a description of computer programs and procedures serving to interpret, from the chemical viewpoint, the signals provided by chemical measurement systems.

A number of methodological lectures dealt with questions of artificial intelligence. Istvan Juricskay (Pecs Medical Science University) described various applications of a new form recognition and classification method, and we could hear about the clinical-chemical use of this method too. Gabor Veress and Gyorgy Teglas gave a paper on expert systems.

Another part of the papers dealt with concrete industrial applications. Tamas Vojnits described a model quality control system prepared for an IBM PC/XT compatible net by the Biogal Pharmaceutical Factory and the General and Analytical Chemistry Faculty of the Budapest Technical University. This system automates the entire quality control process for the most important products of the factory from preparing the sampling ticket through classification to preparation of the job certificate.

In addition to the lectures they gave program descriptions and demonstrations at the seminar. The laboratory integrated program system of LABSWARE (Compudrug) already contains expert systems. In addition the participants could become acquainted with Fourier transform, Monte Carlo simulation, pharmacokinetic graphic, crystal structure display, environmental protection and quality control programs.

The broad need for computer technology proves the necessity for the Kemometria '86 seminar. It also became obvious that although domestic chemometric research is being conducted at a suitable level, its level of organization and the recognition given it are far from adequate. The research achievements and successful applications are thanks only to the enthusiasm of the experts. Even today chemometric research has virtually no sort of organized support; nowhere is significant research being done with budgetary support.

Thus urgent measures are needed so that the implementation of the government program for electronification in the area of chemical measurement technology should be based on something more than the devoted work or hobby of a few researchers!

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HUNGARY: POSTAL SERVICE WILL LEASE HITACHI HIFAX SETS

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 13

[Article by Huba Bruckner: "Image Transmission Service of the Hungarian Post Office"]

[Excerpt] The public telecopying service of the Hungarian Post Office, telefax, has been operating in Hungary since 1 August 1985 between two Budapest stations and five larger cities (Debrecen, Gyor, Miskolc, Pecs and Szeged). Lacking sufficient advertising the interest in the service has been less than expected. At present there is no public international link, because there is as yet no agreement with partner postal organs, there is not enough telefax equipment in our country and the obsolete system of fee schedules makes international cooperation difficult.

According to experience thus far there would be no technical obstacle to introducing an international telefax service within Europe, but there is a problem in the case of countries outside of Europe.

The Hungarian Post Office has Hitachi HIFAX 800 telefax sets. The experience in using them thus far is much more favorable than expected. Both the reliability of the sets and the quality of transmission are better than hoped. (There has been practically no need for repairs, not counting exchanging the burners, which takes a few minutes.)

It is characteristic of the easy installation of the HIFAX 800 that the service equipment for the set consists of one screwdriver and a pair of pliers.

The HIFAX 800 offers all the services described earlier. In the case of the public service of the Hungarian Post Office the fee for the first page is 70 forints, 40 forints for each additional page, and this includes forwarding the document as a telegram.

On the basis of the favorable experience with the Hitachi sets the Post Office has issued a model permit for the HIFAX 800; having this any subscriber with a telephone can put such equipment into operation.

Setting Up a Telefax Station

Any subscriber can set up a telefax station with equipment which has a model permit by making use of the installation service of experts from the Post Office. The Post Office hopes that it can provide service for HIFAX sets not acquired by the Post Office as well. This is all the more to be hoped because the number of sets now operating in our country will shortly exceed thirty. At present telefax stations have been set up at only a few domestic enterprises--for example at Mogurt--primarily for international correspondence purposes.

Acquisition and Installation

The price of the HIFAX 800 is about 3,500 dollars. Outside of Japan the sets can also be obtained from a Swiss representative (12,000 Swiss francs). (Faulty circuit cards are repaired in Japan through the Marubeni firm.)

The sets can be leased from the Post Office. The Post Office will install the very capable and reliable equipment, which is controlled by four processors. To make the connection--similar to setting up telex lines--they provide a wall switch box and they set up the link or restore transmission. The set-up charge in Budapest is about 3,500 forints per line, about 4,500 forints per line in the provinces. The price of the paper needed is about 1,300-1,400 forints per roll.

At present the Hungarian Post Office charges the normal time proportional call or long distance fees for the telefax service.

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HUNGARY: PRICES OF MICROCOMPUTER SOFTWARE

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 14

[Article by E. M.: "Domestic Microcomputer Programs; In the Pull of Prices"]

[Text] A distribution of the domestic software market according to applications for machine types can be given in five larger groups: Commodore-64 applications, CP/M and compatible applications, MS-DOS and compatible applications (the IBM PC line), the VT-20 family and an "other" group which is most heterogeneous.

Naturally we should not regard the C-64 as a professional system, but its mass use justifies discussing it as an independent market segment. It is an unfortunate fact that at a majority of enterprises and various sorts of organizations this machine type still represents "the use of computer technology."

The significance of the CP/M segment is gradually diminishing, but it is justified to talk about the prices because of its present market share.

The MS-DOS and compatible applications are increasingly dominant and there can be no doubt that they will play a major role in the future.

Although the VT-20 family is compatible only with itself its fairly broad use (about 400 systems) justifies removing it from the "other" category.

Operating Systems

The development of the software market obviously follows that of the hardware market. The extraordinarily swift spread of the IBM PC (MS-DOS), becoming a world standard, is an unambiguous trend. The following table illustrates the domestic manifestation of the software aspect of this trend.

The number of programs prepared for the C-64 is still increasing somewhat, but the process is already slowing. Their share within all applications is already past the peak, and a further decrease can be expected.

The CP/M and compatible applications have been waning for some time; the development of new programs can be done now only with increasing risk.

Percentage Distribution of Domestic Microcomputer Applications According to Operating System (or Machine Type)

Operating System (Machine Type)	1984	1986 June	1986 October
Commodore-64	26	30	25
CP/M and compatible	22	20	15
MS-DOS and compatible	4	28	40
VT-20 family	15	5	4
Other	33	17	16
Total	100	100	100

The spread of MS-DOS programs was fascinatingly swift, and the process can be expected to strengthen yet further. With the market entry of new machine types and developers (and vendors) their applications share may reach 50 percent--even within a few months.

The market share of the VT-20 family is gradually decreasing; program development can be expected only for installed systems, for independent developers are favoring the IBM PC market, which is surer in the long run.

The "other" category is shrinking in a striking way; this reflects a striving for a "sort of" compatibility and a just requirement for the "transportability" of programs.

Trends

The striking drop in prices for microcomputer hardware, not at all characteristic of our economy in other areas, is a well known phenomenon to every user, one greeted with joy.

Obviously the users of computer technology are interested in seeing a similar phenomenon on the software market too. Well, to anticipate the final result of our analysis, we must say that such a trend does exist but it is not so unambiguous, not so general and not so sweeping as in the case of hardware.

Operating System, Machine Type	Average Price of Software (in thousands of forints) 1984	Oct '86	Change (in 1,000 forints)
C-64	27	25	- 2
CP/M	82	36	- 46
MS-DOS	42	69	+ 27
VT-20 family	57	45	- 12
Other	150	32	-118
Total *	72	41	- 31

*Simple (not weighted) arithmetic average.

The average price for C-64 software has hardly changed compared to 1984. The data can be regarded as realistic--as we averaged from almost 200 members.

The development of prices coincides with what we said about the shift in the applications ratio. Use of the C-64 is at its peak; we cannot count on a price increase, we cannot yet count on a price decrease.

The average price for CP/M and compatible applications shows an unambiguous decrease (following the hardware price trends). It is probable that the size of the decrease is not so great as appears from our table. Here, however, we evaluated on the basis of less price information, so the distortions may be greater.

The average price of MS-DOS programs rose compared to 1984. The picture, however, is more complicated. There was a drop for some machine types and applications and a price increase for others.

The VT-20 price trends speak for themselves.

It is probable that the data for the "other" category are most distorted for both years, but a price reduction trend is characteristic in any case.

Diversified MS-DOS

The development of prices for applications prepared for IBM PC/XT compatible machines shows an interesting picture.

From 1985 to 1986 some vendors (primarily older ones) reduced the price of their MS-DOS programs. As an example let us look at the prices of programs prepared for two machines of the SZKI [Computer Technology Research Institute and Innovation Center] and the Instrument Technology Cooperative.

Instrument Technology raised the price for only one of its products (by 52 percent) while reducing that for others by 13-58 percent, thus giving an average price reduction of 33 percent.

At the same time the SZKI (Proper-16) raised the price of some of its software to the same degree that it reduced it for others, so the average price reduction was only 4 percent.

Machine Type	Average Price (1,000 forints) 1985	First half '86	Change (percent)
Proper-16 (SZKI)	54	52.0	- 4
MXT (Instrument Technology)	56	37.5	-33

The fact that the average price of IBM PC compatible programs rose compared to 1984 can be attributed to the fact that there are very many new manufacturers and vendors in this market segment who realize relatively high starting prices in their products.

The C-64 and CP/M programs existed earlier than those for the MS-DOS system. Thus the curious situation has arisen that the IBM PC version of a program costs on an average about 1.5 to 2 times as much as a corresponding one running on any other type of machine, while the MS-DOS machines have become the standard for microcomputer applications even here.

What Does It Cost?
One should study the price of a given computer system by taking into consideration both the hardware price and the price of the programs which can be used on it. A single component cannot be used by itself.

It may be that a certain configuration is cheaper by a certain percentage than other hardware with the same purpose and function. Often we get the software from the same firms as the hardware. Such a link is not rare. But let us presume that the enterprise delivering the more expensive machine sells software (no worse than that for another) more cheaply and let us say that when buying five pieces of software the total price evens out. Then a relative profit is generated when purchasing each additional program.

The index for the comparison is the quotient of the average software price over the hardware price--we can regard the smallest, general configurations as the hardware price--that is, how much user software for the given machine can be bought for what percentage of the hardware price for a given model.

It is also important to observe the change in time for the above index, for a change in any component can significantly influence a change in the ratio (e.g., the already mentioned change in hardware prices).

In the case of the C-64 and Proper-16 an internationally observable trend is easily seen, that software is becoming relatively more expensive compared to the hardware (primarily due to the drastic drop in the price of the latter).

Development of the Ratio (Quotient) of Software/Hardware Average Prices

Machine Type	Hardware Price * (1,000 forints)				Software Price ** (1,000 forints)				Quotient (percent)			
	1984	1985	1986 Jun	1986 Oct	1984	1985	1986 Jun	1986 Oct	1984	1985	1986 Jun	1986 Oct
C-64	180	150	100	100	27	27	27	25	15	18	27	25
TZ-80			95				36				38	
Proper-8			250	250			36	36			14.4	14.4
Proper-16	750	489	266	266	47	54	52	52	6.2	9.4	19.5	19.5
VT-16			260				60				23.0	
MXT		350	260			56	37.5			16.0	14.0	
PC-20			496#	432#			71	71			14.0	16.4
				350##				71				20.2

* Price of general purpose, smallest configuration. There may be some distortion in the prices depending, e.g., on whether there is a printer interface, etc.
** Average price calculated earlier.
# Leasing fee (with 10 M byte Winchester).
Sale price (with 10 M byte Winchester).

The other phenomenon worthy of attention is that in general the software price/hardware price indexes for types which are dying out (C-64, CP/M) are the highest. The reason for this is that the program prices fall much less than the hardware prices (so the index constantly rises) indeed, they cannot go below a certain level--which in our country can be put at 25,000-30,000 forints.

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HUNGARY: SOFTWARE FOR SWITZERLAND

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 15

[Text] Hungarian Software for Switzerland

Hungarian software is already a sought after item in the Federal Republic of Germany, primarily due to its favorable price. The hourly wage of Hungarian software developers working on foreign orders is only 50-60 West German marks. The Hungarians are now trying their legs in Switzerland too.

All this is indicated by the fact that of the socialist countries only Hungary was making bids at the Swissdata 86 exhibit. For the third time already the Metrimpex foreign trade enterprise represented the SZAMALK [Computer Technology Applications Enterprise], SZKI [Computer Technology Research Institute and Innovation Center] and Comporgan software houses at a joint stand. The Hungarians are successfully deploying their well trained expert reserves on the software customer market created by the shortage of Western experts. Ten different foreign trade enterprises represent roughly two dozen Hungarian software houses. It is reported that their foreign exchange income from software export and leasing manpower can be estimated at 20 or more likely 30 million dollars.

The offerings of the Hungarian software houses include the export of program packages prepared for commercial, industrial and agricultural applications, fixed price projects and the leasing of manpower, for large computers (IBM, Siemens, Nixdorf, Honeywell-Bull), small computers and personal computers.

In the case of fixed price projects the Hungarian partner sets the price and takes the risk of making something on it.

In the case of manpower leasing the Hungarian software specialist works for the customer for 1-1.5 years, as long as development of the program takes. This form of employment is now completely accepted; at present roughly 300 Hungarian computer experts work abroad.

The situation is more complicated with Switzerland. It is extraordinarily difficult to get employment and residence permits. This is forcing the Hungarians to grotesque solutions; they rent a house on the Austrian side of the border and the Swiss partner goes back and forth with the material.

Hungarian software vendors are seeking the possibility of cooperation with a Swiss software house. This might facilitate our access to the Swiss and other Western European markets.

A Base In Zurich

In 1984 the Consulting AG in Zurich and the OKISZ [National Federation of Artisan Cooperatives] and the Intercooperation Company in Budapest founded a joint Swiss-Hungarian enterprise under the name of the Consorg GmbH. The purpose of the enterprise is software marketing and export in addition to operational organization tasks. Fifty-one percent of the one million forints base capital is in Hungarian hands.

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HUNGARY: OFFICIAL INTERVIEWED ON STATUS OF ROBOTS

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 21

[Interview with Laszlo Helm, of the Ministry of Industry, by Tamas Kolossa: "What Is the Situation?"]

[Text] Laszlo Helm, a chief worker at the Ministry of Industry and deputy first secretary of the MATE [Measurement Technology and Automation Scientific Association], is a well known expert in robot technology. On the occasion of his introductory speech at the Mechatroninfo conference we asked him for a brief interview.

[Question] How do you see the developmental trends for robot technology?

[Answer] Foreign experiences show that industrial robot technology, which has been developing swiftly already, stands before an epochal change. On the one hand a new generation of robots is being developed the members of which are suitable for more than execution of a repetitive sequence of movements. On the other hand--and interdependent with this--the conditions for complex, mass use of industrial robots have been created. The development of electronics has created the possibility for development of robots substantially more intelligent than before, able to adapt to the environment and carry out complex tasks. The chief characteristics of the new robots are an arm system with a structure similar to that of a human arm, controlled direct current motor drives, greater load capacity, increased movement speed with more precise operation, a possibility for automatic exchange of graspers and tools, greater reliability, microcomputer controls offering very many services and use of sensors increasing adaptivity.

[Question] What are the details we should pay attention to?

[Answer] The development of the arm system for robots is interesting, the development of the articulated (so-called humanoid) arm. Within this we can find equipment moving in a vertical main plane (e.g., Unimation) and more recently equipment with a horizontal main plane. At present development of the latter is the most dynamic. Characteristic representatives are the IBM 7535-B04, the Hirata ARM-BASE, the Yamaha KRAFT and the Bosch SR 800. The unique feature of the horizontal main plane multi-articulated robots (their foreign name is SCARA--Selective Compliance Assembly Robot Arm) is the flexibility

shown in the horizontal plane and the rigidity in the vertical direction, which makes them especially suitable for execution of assembly operations. From the viewpoint of the development of domestic manufacture of the SCARA type it is noteworthy that they represent a high technical level and at present there is no such type on the CEMA market.

[Question] How are computer controls developing?

[Answer] The most essential of the services are combined point and track control (linear and circular interpolation), large memory capacity, coordinate transformation, 16-40 analog and digital I/O channels with a possibility of programming waiting times, track speeds which can be set by phases in many steps, program archiving, a possibility for connecting external sensors and a master computer, operation feedback and self diagnostics. The latter is a solution which is spreading more and more; the control unit observes its own operation with test programs, either continually or by sampling, and intervenes in case of error. The robot specific programming languages such as VAL, HARL and BAPS greatly increase the convenience of programming. The swiftly developing sensors significantly increase the level of control. The development of optical sensors is especially striking. Well developed designs already characterize the 3D force and pressure sensors which can be built into the joints of robots.

[Question] Let us turn to the most important domestic questions. There have already been a number of big events in connection with the G/6 program, but one can learn little about the details. What is the situation with the second sub-program, what concrete steps have been taken?

[Answer] This subprogram is closely linked to the others and since there are extraordinarily many competitions in the case of G/6 we can, unfortunately, say little about the results of them for the time being. A decision has been made in the case of a few competitions (at the end of November 1986--the editor), there has already been a rejection in one or two cases. I must emphasize that the chief goal of the program is applications. Although we have traditions in it we do not want to pursue the dream of being a great power in robot manufacture. From the viewpoint of manufacture all we are planning is to satisfy 30-50 percent of the domestic needs from domestic manufacture, and we must create a high level exchange base to facilitate importation of the remainder; this will make it possible for us to set up complex, flexible manufacturing systems. One can count on central resources where one can expect an increase in convertible export or where robotization will contribute in a progressive way to increasing the general technological level of industrial production.

[Question] Thus far our international contacts in the area of robot technology have been moderate. What can one expect from the INTERROBOT Agreement?

[Answer] In December 1985 representatives of the Soviet Union, Czechoslovakia, Bulgaria, Cuba, Poland and Hungary signed the agreement which created the international robot technology research and development association called INTERROBOT. The goal of the cooperation, which multiplies our forces, is to ensure technological development and scientific research according to uniform

principles, to support standardization and ensure conditions for normative requirements. Its task is to prepare to improve specialized and cooperative manufacture. We jointly maintain the Moscow center; the Hungarian national center is now being set up at Tungsram. We consider all this an effective tool; we have reported our interest in the matter of concrete work and coordination activity. Harmonization is now taking place.

More Important Events in the Spread of Robot Technology in Hungary

1972 Acquisition of first servo controlled robot.

1974 Showing of the CSMSZG IR-51 servo controlled robot at the Budapest International Fair.

1975 Submission of first Hungarian robot patent.

1976 Introduction of the pneumatic reloading robot of the Eger Precision Fittings Factory. The SZTAKI [Computer Technology and Automation Research Institute] prepares an experimental computer controlled assembly robot for research on intelligent robots.

1977 First industrial use of a system containing several servo controlled robots at the Hodmezovasarhely factory of the FIM. The special committee of the GTE [Machine Industry Scientific Association] holds its first colloquium.

1981 Manufacture of reloading robots begins at the Gyongyos Factory of Tungsram to fill Soviet order. Automation program starts within the A/2 framework of the OKKFT [National Medium-Range Research and Development Plan]. Agreement made in the Machine Industry Permanent Committee of CEMA for development of robot technology. According to participants at conference held by the MATE there are 20 robots working in the country.

1983 Robot competition announced within the A/2 framework of the OKKFT with 100 million forints of central support.

1984 Vision module developed at the SZTAKI introduced.

1985 The CSMEG hydraulic servo controlled robot and the electrically controlled robot of the Gyor REKARD, based on a license, appear on the market. Hungarian Robot Technology Society formed.

1986 INTERROBOT Agreement signed. A separate robot technology development program started within the G/6 framework of the OKKFT. According to surveys there are 60-80 robots in the country.

(Source: An analytical study of the OMFB [National Technical Development Committee], "Expected Effect of Robot Technology on the Hungarian Economy," August 1986.)

8984
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HUNGARY: DEVELOPMENT OF ROBOT CONTROL SYSTEMS

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 1, 14 Jan 87 p 22

[Article by Andras Siegler: "Robot Controls"]

[Text] During the past 5 years the Computer Technology and Automation Research Institute (SZTAKI) of the Hungarian Academy of Sciences has undertaken a crucial role in the development of robot guidance equipment. The theoretical and laboratory research conducted since the middle 1970's in the area of artificial intelligence and control of discrete processes created the possibility for successful work. But in order to develop devices which could be handed over to industry there was a need for support which was provided by the Ministry of Industry, the National Technical Development Committee and the Hungarian Academy of Sciences in research and development contracts signed within the framework of the A/2 program of the OKKFT [National Medium-Range Research and Development Plan] titled Research on Intelligent Robots.

Following several years of developmental work they began industrial testing and then series manufacture of the VM-02 industrial form recognition robot control equipment, based on a 16 bit microcomputer, suitable for robot control and simultaneous service to two work stations. As an auxiliary element for the control system of a panel painting robot they selected and started a painting program able to deal with objects arriving in a chance sequence. In addition to identifying the panels the equipment was suitable for determining the correctness of panel suspension. Integrated into a manufacturing cell and connected to a FANUC type machine tool serving robot it identified the position of the work piece to be moved by the robot and influenced accordingly the movement program of the robot. Connected to a Unimate assembly robot it identified the position of the work pieces arriving on a conveyor belt and timed the starting of the program of the robot moving the work pieces. Connected to a PUMA type robot assembling ceiling lamps for autobuses it controlled the robot in such a way that it could pick up one at a time and assemble into the lamp body bulbs appearing on the work table simultaneously in large numbers and in random positions.

Also in the interest of increasing the adaptivity of industrial robots the SZTAKI and the Caliber Factory of the MOM [Hungarian Optical Works] jointly developed a force-pressure sensor which could be built into six component robot joints; this is already being manufactured and it is suitable for

sensing impacts between the robot and its environment and for increasing the flexibility of robot assembly. For a similar purpose they process the signals of distance sensors within the robot control and as a result modify the robot movement programs while they are being executed. Both the force and distance sensors have been tested in the controls for an assembly robot.

Significant research work is being done within the framework of the OKKFT project to build up a software background for advanced robot guidance. General purpose robot guidance software has been developed for an IBM PC and is now being tested; because of its modularity it will be suitable for programming various types of industrial robots which use different programming languages in a uniform language which can be defined by the user or selected from a prepared assortment. In the future this software tool will serve as the programming base for general purpose robot controls and will ensure that the general purpose robot control unit can handle the central guidance functions for different types of robot manipulators.

In the interest of making robot programming and robot control independent they developed a robot movement simulator which uses computer graphics devices. The IBM PC type program package containing 3D geometric modeling and variable display possibilities combined with hidden line depiction is suitable for geometric modeling of the kinematic structure of robots, their tracks and work environment, for programming the movement of the models via an animation program language and conversational data input and for running robot programs, observing the possible collisions. The robot programs checked on the simulator increase the certainty of offline robot programming.

The general purpose, robot control, form recognition equipment mentioned earlier has a version now in series manufacture made essentially of elements which can be obtained from the socialist relationship; called the Mikromat-8001, it is suitable for processing signals arriving from the external sensors of the robot, simultaneously providing point control of the robot. An IBM PC or compatible personal computer performs the central processing of the robot program, which appears in text form, and takes care of the track planning and track calculation tasks. The Mikromat-8001 can be connected to the IMS robot axis control servo units, a domestic development manufactured by the Mechatronika Cooperative, thus becoming part of a complex robot control device which is entirely a domestic development. This system is suitable for control of the robot manufactured by Gyor Rekard on the basis of an IGM license, the PUMA robot of the Unimation firm, or other similarly developed robots.

Combining the above mentioned three levels of robot control into a system took place in 1986.

The development of robot control equipment will continue and expand in the present 5-year plan--again with significant central support--as part of a competition system, and manufacture of such equipment has begun at Tungsram as part of international cooperation and on the basis of license purchases.

8984
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HUNGARY: OPTICS RESEARCH AT PHYSICS INSTITUTE OF BUDAPEST TECHNICAL UNIVERSITY

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 10-11, 1986 pp 289-290

[Article by Janos Giber and Peter Richter, Atomic Physics Faculty, Physics Institute, Budapest Technical University: "Optics Research at the Atomic Physics Faculty of the Physics Institute at the Budapest Technical University." The first paragraph is the Hungarian language summary.]

[Text] In the introduction the authors briefly describe the educational and research activities of the Atomic Physics Faculty, the close interdependence between these activities and the internal and external conditions for them. They outline the trends of research done in the area of optics--laser remote analysis, acousto-optics and various optical methods for contact-free industrial measurement techniques.

We were happy to satisfy the request of the journal of the Optical Acoustics and Film Technology Association of the METESZ [Federation of Technical and Scientific Associations] to report on the optics research taking place at the Atomic Physics Faculty of the Budapest Technical University.

We seize the occasion to report on the results we have achieved in this area in the recent past, but at the same time, by way of introduction, we would like to describe the general activity of our Faculty and of this group therein.

The educational and research activity of the Atomic Physics Faculty is determined fundamentally by the idea that in both areas we do not want to conduct activity divorced from reality but rather that our activity should satisfy to a maximal extent the needs of domestic industry in this area of technical physics. We seek out, feel and try to satisfy these needs indirectly and directly in both instruction and research.

Let us look at education first. We had to recognize that with the appearance of ever new techniques and technologies physics, regarded traditionally as basic engineering training, is becoming part of engineering practice. For this reason we are developing our basic training (which takes place primarily in the Electrical Engineering School but to a lesser extent in the Chemical Engineering School as well) in the direction of meeting this mission ever better. We reworked the teaching of physics in the Microelectronics Technology

section and developed a new technical physics students' laboratory. We introduced new postgraduate (doctorate) training in the course of which we train technical physicists for the large industrial enterprises (Tungsram, the Microelectronics Enterprise, Videoton) in areas defined by the enterprises; each year this involves 10-15 people. Today these students, on the basis of the work thus done, have the opportunity of competing for an interdisciplinary title of doctor of technical physics at the Technical University. After completing their training, on the basis of their experience, they easily fit into their places of work and make good use of what they have mastered in the course of training.

In the area of research the Faculty is active in two fundamental directions--surface physics and optics. Basic research problems are dealt with in both areas, but at the same time, in a number of cases, this makes possible the answering of concrete industrial and technological questions and tasks. We sense very well the interaction of theory and practice and in a number of cases it happens that the solution of some concrete technical problem becomes possible only thanks to new basic research. We do not do our research work in isolation but rather in cooperation with a number of university faculties, industrial enterprises and research institutes. The concrete practical character of the research makes this necessary, for sometimes the solution of a problem requires many sorts of experimental or theoretical approach and we do not want to limit this by the possibilities which can be found within the walls of the Faculty.

Total personnel of the Faculty comes to 59 persons; 20 of these are instructor-researchers, of whom seven have advanced scientific degrees. Considering that the average age of the faculty is under 40 years we can call the ratios favorable. The Faculty has good international contacts in the Soviet Union, the GDR, Austria, the FRG, France and the USA.

In addition to the research laboratories we have at our disposal well equipped mechanical and electrical workshops and various technological laboratories.

Research in the area of optics takes place on a number of themes. Although we started these several years ago our correct selection is shown by the fact that all of them can be linked to some part of the CEMA complex long-range program aimed at introducing peak technologies:

--in the area of new sensors and control and measurement devices: laser remote analysis methods to measure air pollution and development of associated devices and use of photo-acoustic spectroscopy for nondestructive materials testing;

--in the area of creating new communications systems: high speed acousto-optical signal processing devices;

--in the area of creating microelectronic manufacturing equipment: optical wafer deformation measurement;

--in the area of automated devices to monitor technological equipment: non-contact determination of surface quality and dimensions;

--in the area of devices for active control: devices for on-line surface quality measurement in the paper industry and for on-line measurement and monitoring in the manufacture of fiber optics.

The themes are all linked to concrete domestic needs but at the same time they are advanced research and development tasks on the international level. The new principles, methods, procedures and equipment are based on the most recent achievements of optics, laser technology, opto-electronics and electronics. As will be seen from the articles the themes are connected with one another substantively too; that is, in a few cases we were able to use the same solution to solve several tasks apparently remote from one another. This made it possible for us to undertake to cultivate such a large area with relatively limited personnel.

The ten person expert staff provides the most important condition for research; they bear a worthy part of these themes. We consider it very important that despite the young average age (35 years) all of them have industrial experience, which fundamentally determines their way of viewing things. The researchers can rely on the well qualified staff which is available to carry out concrete tasks in the workshops and technological laboratories (optical work, X-ray orientation, crystal breaking, vaccum steaming, protective gas precision welding, etc.). We also receive important aid from the industrial partners cooperating in the themes; they participate in solving the tasks as equal members of the research groups. Finally we must mention the participation by students in the research. On a number of occasions in the course of the already mentioned instruction it was possible to link the needs of industrial expert and researcher; that is, in addition to solving the task we were able to produce a well trained expert. More than one co-author of the present compilation was earlier a scientific club member, a student working for a degree or a doctoral student at the Faculty.

The equipment for optics research cannot be called too ample; rather, it can be regarded as strictly task oriented. This follows from the fact that in the course of concrete commissioned research we were able to obtain our tools only as charged to such research, so it is in a relatively narrow area. This sort of development of the infrastructure and instrument inventory, however, does not provide for a renewal of basic research. In this regard the state competitions are the only realistic help.

The basic research taking place in the area of optics can be regarded as significant in the scientific respect as well. Each year our publications number 15-20 and a significant number of them appear in international periodicals. This is also made possible by the fact that we try to deal with practical themes or approach concrete tasks which are in the forefront of the interest of modern optics today.

We have direct research cooperation with universities in Vienna, Helsinki and Karlsruhe. In regard to the practical solution of technical problems we have about 15 patents and the number of them grows by two or three per year.

In the following nine articles we describe the chief research achievements of recent times.

One of our most important areas is laser remote analysis measurement techniques. The first article summarizes the principle of this and its applications for environmental protection. Connected with this we have achieved a number of results in the area of the wave guide laser light sources used here (second article) and in the creation of equipment to measure the infrared absorption coefficient (third article).

Our other big research direction is acousto-optics, which in addition to being research on interesting new optical methods made necessary the creation of a considerable optics technology base (fourth article).

We are working with great strength in various practical areas on opto-electronic realization of contact-free measurement techniques. This includes measurement of the diameter of fiber optics during manufacture (fifth article), paper surface smoothness measurement (sixth article) and measurement of machine industry surface roughness (seventh article), and a measurement technique working on a new photo-acoustic principle which might be listed here (eighth article) with which we do a broad scale of materials studies. In this theme area we recognized that the use of image sensing devices was opening new possibilities. We started research in this direction recently (ninth article).

At the end of the introduction we would like to thank the former and present directors of the Physics Institute, Dr Albert Konya and Dr Bela Vasvari respectively, and the former leaders of the Faculty, Dr Istvan Kovacs and Dr Laszlo Lang, for their support of our work.

We would like to thank our faculty colleagues Jozsef Balint, Istvan Balint, Mrs Alajos Bobak, Andras Blazsek, Mrs Laszlo Horvath, Mrs Laszlo Meggyesi, Imre Molnar, Mrs Jozsef Varga, Bela Vagi and Sandor Varkonyi for the effective aid they have given the work thus far.

We especially thank responsible editor Endre Toth for inviting this report and for his attentive care of the material.

8984
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HUNGARY: USE OF LASERS TO DETECT AIR POLLUTION

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 10-11, 1986 pp 291-295

[Article by Peter Richter, Imre Peczeli, Laszlo Halasz, Janos Giber and Ferenc Engard, of the Atomic Physics Faculty, Physics Institute, Budapest Technical University, and Tivadar Lippenyi, of the Tungsram Joint Stock Company: "Laser Remote Analysis Methods and Their Use to Measure Air Pollution." The first paragraph is the Hungarian language summary.]

[Excerpts] The authors review the basis for the operation of active laser equipment suitable for remote analysis purposes. They show the advantages of the new measurement technique in the area of air pollution measurement. They discuss in detail the operating principle and structure of differential absorption lidar (DIAL). They describe the structure and chief parameters of an infrared, heterodyne differential absorption lidar developed at our Faculty on this principle. They describe their studies pertaining to the signal fluctuation effects produced by turbulence along a long atmosphereic light path.

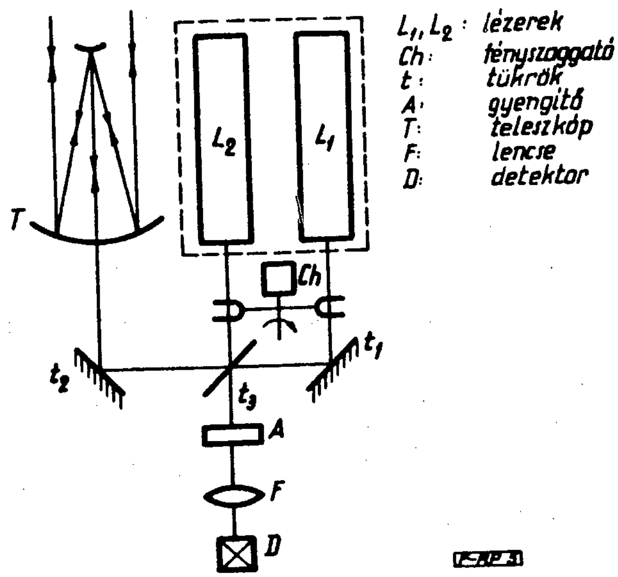
At the Atomic Physics Faculty of the Budapest Technical University we developed a differential absorption lidar operating in the 10 micron wave length range. The choice fell on this wave length range because it is the operating range of tunable CO_2 lasers. Due to a fortunate coincidence there is a "window" in the absorption of the atmosphere here, so base absorption is not a disturbing factor. We could indicate on this differential absorption lidar 88 different materials out of the nearly 300 contained in the list of the National Environmental and Nature Protection Office which are regulated by planning guide figures. For example, we could indicate sulfur dioxide, ammonia, sulfur hexafluoride, benzol, etc.

We had as our goal the development of a relatively small, easily operated device, so we had to choose a small output laser light source. This involved increasing the sensitivity of the light measurement, which we achieved with optical heterodyne detection.

Figure 5 shows the structure of the measuring device. The chief parameters of the device are the following:

--operating wave length: 9.2 to 9.6 and 10.1 to 10.8 microns;
--output power: 1 to 2 W, continuous;
--telescope diameter: 15 cm;
--output of local oscillator: 10^{-4} W;
--IF frequency: 100 kHz to 10 kHz;
--noise of detection: about 10 x the quantum limit.

Figure 5. Structure of Differential Absorption Lidar



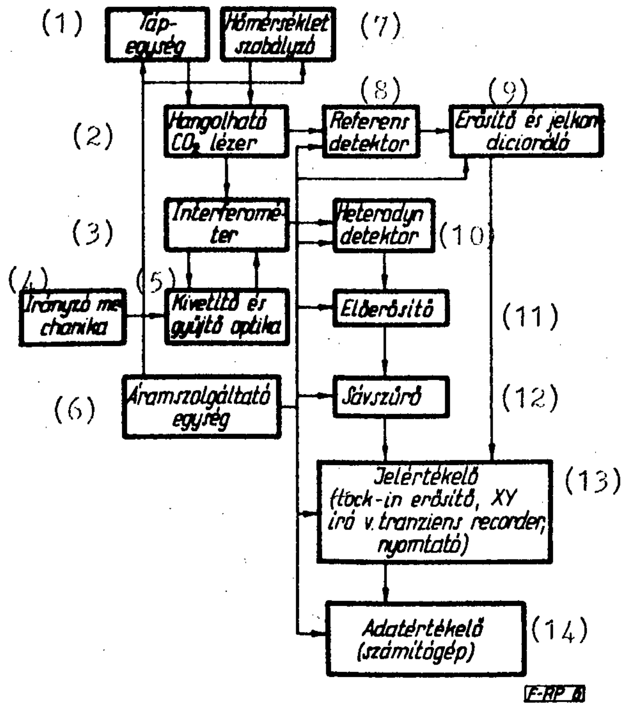
Key:

L1, L2--Lasers
Ch--Light interrupter
t--Mirrors
A--Attenuator
T--Telescope
F--Lens
D--Detector

Figure 6 shows a diagram of the electronic unit processing the signal of the detector. The chief typical feature of the system is that by using a detector it becomes possible to measure the light intensities emitted or diffracted back on two wave lengths. In this way possible output variations in the laser light sources do not disturb the measurement. The integration time of the device is typically one second. The device provides the value of the concentration integrated to the path length averaged for this time in such a way that we program into the signal processing system, in advance, the absorption coefficient difference of the material to be indicated at the measurement wave lengths. The power of the equipment is strongly material dependent, for indicating materials with different absorption coefficients makes necessary different light intensity measurement precisions.

An experimental model of the device is now under development. The chief parameters expected are a sensitivity of 10^{-6} to 10^{-2} (mol/m^3/m) and an effective range of 100 to 2,000 meters.

Figure 6. Structure of the Lidar Electronics



Key:

1. Power unit
2. Tunable CO_2 laser
3. Interferometer
4. Aiming mechanics
5. Projecting and collecting optics
6. Current supply unit
7. Temperature regulator
8. Reference detector
9. Amplifier and signal conditioner
10. Heterodyne detector
11. Pre-amplifier
12. Band filter
13. Signal evaluator (lock-in amplifier, XY writer or transient recorder, printer)
14. Data evaluator (computer)

Signal Fluctuation Caused by Atmosphereic Turbulence

In the course of experiments done with the device, when detecting light scattered back from a great distance, we could observe a strong fluctuation of the measured signal. The fluctuations disturbed the measurement, for they reduce both the minimal detectable concentration and the effective range.

We studied the cause of these fluctuations and the possibilities of eliminating their harmful effect. The basic causes of the fluctuations are the refraction index variations which arise in the atmosphere along a long light path (1,600 meters in our experiment). There is no way to eliminate these, so we had to study how we might average out their effect.

The literature is rather contradictory in this regard. The most common supposition is based on a mechanism whereby the refraction index variations

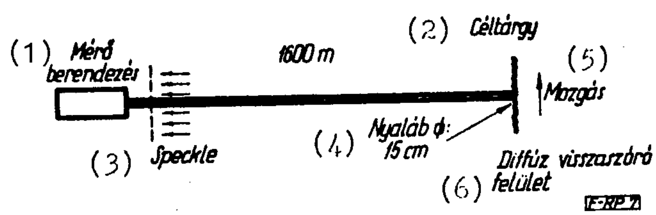
lead to a distoration of the wave front, due to which the spatial coherence needed for heterodyne detection breaks down. According to other investigations the correlation distance of the refraction index in a strongly turbulent atmosphere is 10 to 20 cm, so in the case of a beam with a diameter of about 15 cm this effect cannot be expected. We showed that the cause of the signal fluctuations is a change, caused by the refraction index variations, in the "speckle" image coming into existence as a result of interference from diffuse back scattering surfaces. To show this we performed the experiment illustrated in Figure 7. Table 1 contains the measurement results.

Table 1.

	Target		
	Standing Still	Moving Slowly	Moving Quickly
Speed of target (m/s)	0	10^{-2}	10
Signal modulation depth (%)	10-20	50-100	1
Modulation period (s)	1-5	3-15	1-5

equals beam diameter
over speed of target

Figure 7. Experimental Set-up to Study Effect of Atmospheric Turbulence on Laser Light



Key:

1. Measuring equipment
2. Target
3. Speckle
4. Beam diameter 15 cm
5. Movement
6. Diffuse back scatter surface

It can be seen that in this case, if we increase the speed of the change in the "speckle" image with swift movement of the target then we have well averaged out the signal fluctuations. If this could be attributed to another effect then this speed change alone would not have led to this result.

It is an important result of this experiment that integrating out the "speckle" noise is absolutely necessary in order to perform the measurement. For this reason also it is fortunate that we chose a continuous operating laser light source, because the operation of systems based on high power, pulse operation lasers would be made unreliable by this fluctuation.

Summing Up

The laser remote analysis device under development is intended to be a new tool to measure air pollution. After solving the research tasks necessary for this we are now developing a version which can be used directly in environmental protection; it will make possible the fast execution primarily of emission measurements, but also of immission and transmission measurements. Thanks to this environmental protection will have a measurement technique which can be called the most modern even by world standards.

8984
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HUNGARY: RF EXCITED WAVEGUIDE CO_2 LASER

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 10-11, 1986 pp 296-300

[Article by Istvan Toth, Robert Wittmann, Kalman Antal and Ferenc Halasz, of the Tungsram Company, and Imre Peczeli and Peter Richter, of the Atomic Physics Faculty, Physics Institute, Budapest Technical University: "Radio Frequency Excited Waveguide CO_2 Lasers." The first paragraph is the Hungarian language summary.]

[Excerpts] The authors report on the development of the first domestic radio frequency excited waveguide CO_2 laser. After a brief summary of the theoretical foundations they describe the first experimental model and a further developed design. They give the parameters of operation and outline the problems which arose. The most important step in the further development is creation of a closed system. It is expected that in the near future this type of laser will be widely usable in measurement technology, in microworking of materials and in surgery.

1.3 Radio Frequency (RF) Excitation
The discharges of waveguide lasers can be excited with direct current or with radio frequency current. The advantages of RF excitation are:

--lower excitation voltage (several hundred V);
--due to the positive resistance characteristic there is no need for a limiting resistance, which might cause superfluous loss;
--in the event of a suitably large excitation frequency there is no electrode pulverization;
--due to the smaller field strength the dissociation of the CO_2 molecules decreases significantly; and
--the driving electronics are simpler and smaller.

Because of the advantages mentioned we had as our goal the construction and study of an RF excited waveguide CO_2 laser. We designed and built an experimental model of the country's first such laser.

2. Experimental Model of the Laser
2.1. Structure of the Laser
The laser used a flow system, that is we ensured constant gas exchange from a cylinder with the aid of a pump. The waveguide part of the laser was a square

cross section tube 2 x 2 x 200 mm in size. The two opposing sides were metal--these were also the electrodes--and glass. The two ends are embedded in bakelite sockets on the far side of which are the mirror holders (Figure 1). The end mirror is a flat mirror coated with aluminum. The opening mirror has a curvature radius of 3 m, made of ZnSe, with reflectivity of 85 percent. Rubber O rings serve to seal the mirrors; fine setting is possible with the aid of four screws each. The waveguide is built onto a water cooled aluminum block.

Impedance matching in the radio frequency range represented a special problem. The excitation frequency was about 160 MHz. The electric equivalent circuit of the laser discharge is a parallel RC section. The output resistance of the generator is 50 ohm; in the interest of efficient power feed--and in the interest of providing the necessary ignition voltage--the impedance of the discharge had to be transformed to 50 ohm also. This can be done most simply with an asymmetric low pass filter (Figure 2).

2.2. Operational Parameters

The value of R_k is several hundred ohm; C_k is about 15 pF. The quality of the impedance match can be studied with the aid of a directional coupler and oscilloscope or a vector voltmeter. In the matched state, knowing the values of the transformation members (C_f, L), R_L and C_k can be determined by calculation. Figures 3 and 4 illustrate the gas pressure and feed power dependencies of these. Knowing these values is essential from the viewpoint of designing a later matching cycle.

Figure 3. The Pressure and Feed-in Power (P_{be}) Dependence of the Ohmic Part of the Discharge Impedance 8(R_k)

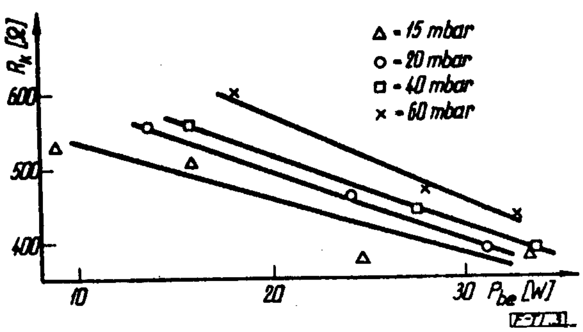
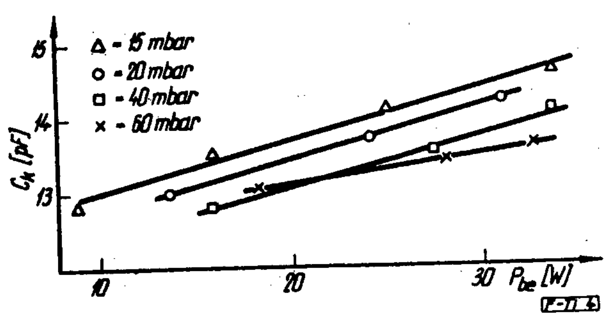
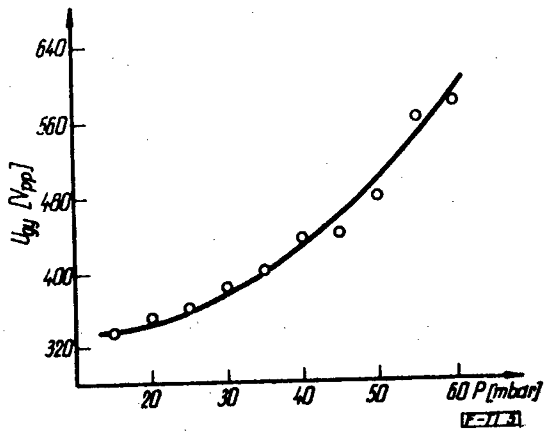


Figure 4. The Pressure and Feed-in Power (P_{be}) Dependence of the Capacitive Part (C_k) Part of the Discharge Impedance



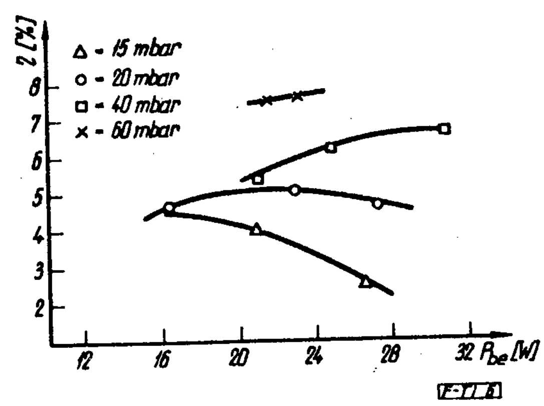
An important parameter in the operation of a laser is the ignition voltage belonging to a given gas pressure. (That is the voltage value connected to the tube for a discharge to appear.) Figure 5 shows these values. We measured the voltage of the electrode with a previously calibrated capacitive probe. Direct galvanic contact with the electrode of a laser is not possible without influencing the matched state.

Figure 5. Pressure Dependence (P) of the Ignition Voltage (U_{gy}) for a Gas Discharge



It was also necessary to measure the output power of the laser to get the measurements connected with efficiency. Power measurement circuits used earlier with other lasers picked up RF interference signals exceeding the measured signal by an order of magnitude--despite their shielded box--which frustrated the measurement. The measurement could be done with the high level signal of a chrome-nickel constantan thermo pair which we prepared. We performed the calibration subsequently. Figure 6 shows the dependence of efficiency on gas pressure and feed power. Efficiency has a maximum as a function of the power fed in; the location and value of this maximum also depends on pressure.

Figure 6. The Pressure and Feed-in Power Dependence of the Efficiency of the Laser



The divergence of the laser beam can also be determined with the thermo pair, by measuring the location of the points of the beam diameter with the same intensity. The divergence had a value of 11 mrad. According to a study of the beam done with a spectrum analyzer the laser operated on the P_{10}-P_{26} and R_{16}-R_{24} lines of the 00° 1-10° 0 transient, above the threshold power which could be sensed by the analyzer. The operating line could be changed with a small movement of the opening mirror, but it always operated on only one line, in the TEM_{00} (EH_{11}) base mode derived from the heat trace.

2.3 Other Findings

In the course of operation we also gained experience with the structural development and materials used. The glass sidewalls bore the high temperature of the discharge and the temperature difference developing between their edges without being damaged. The same can also be said of the adhesive. The bakelite holder on the suction side wore away due to the high temperature gas and its outlet hole widened significantly (from a diameter of 4 mm to one of 7 mm). The gas flow carried the dust to the end mirror, so it has to be cleaned frequently. It also proved necessary to look for a way to strengthen and better re-enforce the mirror holders. Cooling the sidewalls of the discharge cavity is important from the viewpoint of increasing efficiency. The task of the water cooling used--due to the smaller degree of temperature reduction--was rather to keep the structural elements at a constant temperature during operation, so it did significantly reduce mirror movements caused by heat dilation.

3. Further Development of the Laser Design

3.1. Waveguide Structure

In the interest of eliminating the faults in the design described and increasing the stability of operation we planned and built a second waveguide laser. Figure 7 provides a structural drawing of the laser. The discharge cavity here also is a 2 x 2 mm square cross section waveguide. The cavity is 200 mm long; at the given excitation frequency (150 to 165 MHz) this ensures the axial homogeneity of the discharge.

We must select the materials defining the cavity in such a way that when conducting light at a wave length of 10.6 microns the loss should be minimal and so that working their surfaces to the desired precision should not run into difficulties. On the basis of a calculation of the interdependency between the real part of the refractive index and the loss factor Abrams and Bridges showed that BeO is most suitable for guiding light at a wave length of 10.6 microns. Although the loss factor of glass is smaller than that of BeO by two orders of magnitude we are using quartz glass for insulation between the electrodes and to guide the light, because of the difficulties of obtaining BeO. An established technology for working it and its heat resistance speak for quartz glass. From the waveguide viewpoint $Ni_{10}K$ or aluminum are the best electrode materials. But working these materials to the desired surface precision is intricate so we selected steel as the material for the electrodes (positions 1 and 2, Figure 7). The high precision working of the electrodes is done in the MOM [Hungarian Optical Works] Calibre Factory. The deviation from flat of the steel sheets has a tolerance of 4 microns, the maximum parallel error of their edges is 6 microns. The surface error of the pierced 5.4 x 20 x

200 mm quartz glass sheets is smaller than 0.5 microns. Screws with elastic washers fasten the electrodes and the quartz glass sheets to one another, so that tensions due to heat expansion will not lead to breaking the glass sheets.

The waveguide system is fastened to the heat conducting block in the manner shown in Figure 7.b (position 5, Figure 7).

At most a few watts leave as light power from the 30-60 W power pumped into the laser. The remaining large power is transformed into heat in the discharge. We lead this off through the heat conducting block. Springs (position 22, Figure 7) press the heat conducting block to the inner wall of the vacuum cylinder (position 6, Figure 7). The fit of the two surfaces to one another must be very precise because a heat conducting grease cannot be used between them--within a vacuum. Increasing the touching surfaces justifies the special form of the heat conducting block.

3.2. Development of the Laser Resonator

The critical point in designing the laser resonator is minimizing the coupling loss between the mirrors and the waveguide cavity. The radius of curvature of the mirrors and their distance from the waveguide must be chosen so that the feedback is appropriate. According to theoretical calculations this condition is met if the radius of curvature of the resonator mirrors coincides with the radius of curvature R of the wave front:

[Formula 1]

$$R = Z + \frac{\pi^2 W_0^4}{\lambda^2 Z}, \qquad (1)$$

where Z is the distance of the mirror from the waveguide and W_0 is the beam neck.

It follows from this that the coupling loss for the EH_{11} mode will be minimal (the arrangement of the resonator mirrors will be optimal) if

--there are mirrors with a large radius of curvature at the distance of the radius of curvature from the end of the waveguide, or

--the radius of curvature is twice the distance of the end of the waveguide and the mirror, or

--there is a flat mirror at the end of the waveguide cavity.

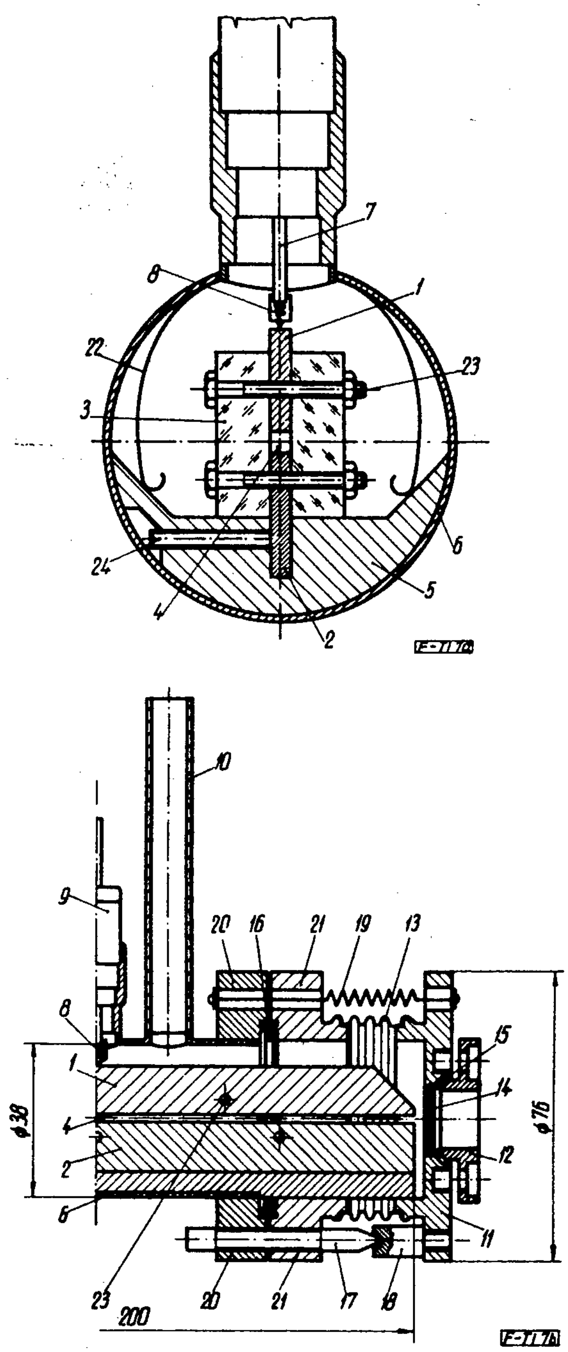
The last solution is the most obvious, but it has the disadvantage that the mirrors must be perpendicular to the optical axis with a very small tolerance. This fact significantly increases the demands on the mechanical precision of the design and makes setting the resonator difficult.

Because of this we chose to use a resonator which consists of one flat mirror and one mirror with a large radius of curvature. The flat mirror is a fully reflecting Al mirror, the decoupling mirror with a large radius of curvature is a ZnSe mirror with 85 percent reflection.

Figure 7. Longitudinal (7.a) and Cross Section (7.b) View of a Further Developed Version of the Laser

Key:

1. Phase electrode
2. Ground electrode
3. Quartz glass side panels of waveguide cavity
4. The waveguide cavity (discharge area)
5. Heat conducting block
6. Holding frame of structure
7. Electric lead-in
8. Electric connection to the phase electrode
9. Vacuum seal and insulating body of electric lead-in
10. Gas lead-in
11. Mirror holder
12. Mirror clamp
13. Vacuum sealing membrane
14. Mirror
15. Rubber O ring
16. Copper packing ring
17. Mirror setting screws
18. Brackets for mirror set
19. Spring holding mirror holder to laser body
20. Inner flange
21. Outer flange
22. Spring clamping heat conducting block to holding cylinder
23. Clamp screw
24. Screw fixing structure of waveguide to heat conducting block



We fix the mirrors (position 14, Figure 7) to the mirror holder (position 11, Figure 7) with rubber O ring packing (position 15, Figure 7), with the aid of mirror clamps (position 12, Figure 7) which can be screwed down. The mirrors could also be fastened with an adhesive, which makes a larger vacuum attainable.

The ends of the three M6 mirror adjustment screws (position 17, Figure 7), at angles of 120 degrees to each other on a 64 mm diameter dividing circle, are conical, and are supported on brackets (position 18, Figure 7) screwed into the mirror holder. The end of one bracket is a a cone with a large opening angle; the end of another is trough-like. The third ends in a flat surface. This makes possible the unambiguous positioning and movement of the mirror holder. Three adjustable strength springs (position 19, Figure 7), and the force resulting from the difference between internal and outside pressure, hold the mirror holder to the laser body.

3.3 Gas Flow Problems

The laser has continuous gas flow, but it was an important design viewpoint that it be formable into a closed system, creating the possibility for study of a more developed, closed system operation. Formability into a closed system presumes the development of high vacuum (10^{-5} Pa) packing, as then it is necessary to exhaust to a high vacuum and then fill with laser gas.

The mechanical frame of the laser is a 35 mm KOR tube (position 6, Figure 7), which also serves to form the vacuum sealing cavity.The electric lead-in is a tested vacuum seal. Power goes to the phase electrode through an electrode (position 7, Figure 7) embedded in the ceramic cylinder. At the location of the gas lead-ins (position 10, Figure 7) and the electric lead-in we formed a short, cylindrical stump by stretching, thus the fittings for energy and material transport can be welded to the vacuum tube by machine--thus with great precision and reliability.

A membrane (position 13, Figure 7) provides movement between the mirror holders (position 11, Figure 7) and the vacuum tube. The welding of the membrane on the circular table is reliable.

In the case of a closed system the mirrors must be cemented in.

In the interest of being able to replace possibly broken quartz glass sheets or making any unforeseen change inside the laser, it must be possible take the vacuum tube apart. An opposing flange (position 21, Figure 7) presses the copper packing ring (position 16, Figure 7) against the flange (position 20, Figure 7) welded to the end of the vacuum tube. Taking out the clamping screws of the flanges made of KOR, the inside of the laser becomes accessible. When reassembling it only the copper packing ring has to be replaced, and the vacuum is again secure and we get a fastening that can be loosened.

Exploiting this possibility we performed a preliminary experiment to decide whether we could get a measurable laser effect using a high purity vacuum system or seeing to the continual purification of the buffer space. Unfortunately with the gas mixture used, in the case of a suitable mirror setting, the laser effect after switching on was only very short (0.5 to 1 seconds). This obviously means that the CO_2 molecules of the CO_2, He, N_2 laser gas dissociated, the replacement of the gas in the discharge cavity is not fast enough, and thus the CO_2 molecules providing the laser transition are "used up" in the discharge space. At the present stage we have not planned gas mixture optimization experiments, so it seemed more to the point to develop a

quasi-flow system by building in a limiting insert. Following the conversion the laser operated continuously.

Preliminary conclusions can be drawn from the case cited regarding the operation of a closed system laser, for prior to the change the gas virtually was not replaced in the discharge cavity. The laser gas used by us (made for high powered industrial CO_2 lasers) is not suitable for a closed system laser. On the one hand the ratio of the CO_2 should be substantially smaller (5 percent) than that (17 percent) of the gas mixture used by the "predecessors" and on the other hand it should not contain xenon, which they use. The Xe reduces the dissociation of the CO_2. So to operate a closed system waveguide CO_2 laser we need a laser gas with a different composition, taking into consideration what has been said.

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HUNGARY: IN-LINE MEASUREMENT OF THICKNESS OF OPTICAL FIBERS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 10-11, 1986 pp 313-318

[Article by Andras Podmaniczky, Miklos Barabas, Lenk Attila Markus and Janos Giber, of the Atomic Physics Faculty, Physics Institute, Budapest Technical University: "Measuring the Thickness of Optical Fibers During Manufacture"]

[Excerpts] In what follows we will describe a method worked out at the Atomic Physics Faculty which is suitable for on-line thickness measurement. For this procedure, suitable for detecting changes in fiber thickness of about 0.1 micron, one needs a constant wavelength (He-Ne) laser and two fixed detectors.

The method makes use of the diameter dependence of the intensity of the light back scattered from the fiber as seen in Figure 7, that is it makes use of the existence of Fabry-Perot type resonances. Illuminating the continuously drawn fiber during manufacture with a fixed, phi_1 inclined angle beam we find that a change in the diameter results in a change in the $I_1(d)$ back scattered intensity. If we also illuminate the fiber with a phi_2 inclined angle beam which has an $I_2(d)$ function shifted by a quarter period compared to $I_1(d)$ then we can also determine the direction and magnitude of the diameter change from the change in $I_1(d)$ and the sign of $I_2(d)$ minus $I_{average}$. Figure 11 shows the theoretical arrangement of the measurement layout.

We produce the two illuminating laser beams forming with one another the angle Delta $phi=phi_2-phi_1$ with a beam divider and a mirror canted a bit compared to it, and we measure the back scatter light arising from the several beams separately.

Figure 12 illustrates the I_1 and I_2 intensities recorded with the experimental equipment during reeling in different directions of a fiber with a constantly changing diameter. (The nominal diameter of the fiber is 14 microns, the refractive indexes are as in Figure 1, the inclined angles are $phi_1=3$ degrees and $phi\ _2=9.3$ degrees.) This proves unambiguously that the proposed procedure makes possible the detection of diameter changes greater than about 0.1 micron. Since the dimensioning calculations and the experiments both show that the system is insensitive to lateral movement of the fiber by a few millimeters and to angle swivels smaller than about 4 degrees the measurement method is suitable for thickness measurement during manufacture. The experiments thus far have been done with thin image transmitting fibers, but

it can be expected on the basis of calculations that the procedure will also be usable for communications engineering fibers.

Summary

Summing up the above we can state that measuring the characteristics of optical fibers by using light diffraction makes possible the development of various on-line quality control methods. The development and use of these procedures is linked to the manufacture of high speed fiber optics communications devices to be created in accordance with the complex program of the CEMA member countries for scientific-technical progress to the year 2000. The thickness measurement method developed at the Atomic Physics Faculty of the Budapest Technical University and described in our article is also a good example of new prospects for laser measurement techniques and hopefully it will aid the domestic appearance of other instruments meeting modern technological needs.

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HUNGARY: PHOTOACOUSTIC RESEARCH AT ATOMIC PHYSICS FACULTY

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 10-11, 1986 pp 328-331

[Article by Laszlo Kocsanyi, Janos Giber and Peter Richter, Atomic Physics Faculty, Physics Institute, Budapest Technical University: "Photoacoustic Research at the Atomic Physics Faculty of the BME (Budapest Technical University)." The first paragraph is the Hungarian language summary.]

[Excerpts] The authors report on photoacoustic research taking place at the Atomic Physics Faculty of the BME. At the faculty they built a photoacoustic spectroscope operating in the visible and NIR light range; they have begun a study of foodstuffs samples with it. In the article they describe the utility of the spectroscope for depth studies. They realized a special measurement arrangement with the aid of which one can measure layer thickness in layer structures.

3. Photoacoustic Spectroscopy (PAS)
As we mentioned above, we already reported on our PAS studies in an earlier article. For the sake of completeness we will here describe only the measurement system, its chief parameters and the pepper powder spectrum recorded with the device. Figure 2 shows the structure of the device. We train the arc of the 450 W Philips Xenon arc lamp in the lamp housing (1) with a pair of condenser lenses (3) onto the input aperture of the monochromator (4). In front of the monochromator we modulate the light with an interrupter (5) at a frequency which can be varied in the 1 to 400 Hz range; this has its own signal transmitter, an illuminating diode-photo diode pair (6)-(7). Then after the monochromator we guide the light of the exiting modulated light beam into the photoacoustic cell (9) in which is placed a Bruel and Kjaer 4148 condenser microphone (10). From the beam we lead a part of the light output with a glass sheet onto the pyroelectric detector (8). Finally, using a dual-lock-in amplifier (12), we measure the photoacoustic (PA) and pyrodetector signal. The structure of the cell was described in our earlier article.

The chief parameters of the spectroscope are:
--spectral range: 350 to 1,000 nm;
--resolution: 8 nm/580 nm;
--amplitude signal/noise relationship: 200/1 mW in the case of illuminating light, on carbon;
--modulation frequency range: 5 Hz to 1 kHz.

4. Depth Studies with the Photoacoustic Spectroscope

The following series of measurements well illustrates the suitability of PAS for depth studies. Figure 3 shows the normalized photoacoustic spectrum of red pepper powder. Increasing the frequency (f=88 Hz, 515 Hz) did not change the spectrum. Figures 4.a, b, and c show the normalized spectrum of red pepper (unground) at different frequencies. The spectrum changes significantly, for the thermic path length decreases while the signal is coming from the thin skin (cuticle) covering the pepper. It can be easily seen that the strong blue-yellow absorption responsible for the red color of the pepper is almost completely lacking from the spectrum measured at 512 Hz; this comes from the carotins forming the pepper. This is what gives the pepper its red-orange color. That is, there is no carotin in the cuticle. Peeling the pepper from the cuticle the red color bodies also come to the surface, going up with the frequency of the interruption. Only near-red infrared absorption is characteristic of the surface layer. When the pepper is ground both constituent elements are found homogeneously in the mixture, so the resultant of the two spectrums will be characteristic of a spectrum made of the powder, and the spectrum will be independent of the interruption frequency.

The photoacoustic spectroscope is being used ever more widely in biological studies of plants and in research on photosynthesis. The reason for this is that the layerings in plants are relatively thick, the absorption path length is very large, and the interruption frequency must be varied in a relatively small range (a maximum of 1 kHz) in order to get into the farthest layer. Many researchers expect a great deal from photoacoustic spectroscopy in research on the cause of the forest destruction which has become increasingly severe in Europe in past years; namely the depth studies will make it possible to weed out the diseased trees in time.

5. Contact-Free Photoacoustic Layer Thickness Measurement on Si Wafers

The Principle of the Measurement

When a photoacoustic signal is produced the propagation of the thermic wave in certain cases makes possible the determination of the thickness of very thin layers as well. This was first demonstrated by Adams and his colleagues (H. J. Adams, ANALYST 101, 1976). To do this we must measure the phases of the photoacoustic signal.

In the case where the optical absorption constant of the substrate is a good bit greater than that of the layer and the thermic properties of the substrate and the layer are nearly identical, the phase delay of the photoacoustic signal can be written in the form

[Formula 3]

where Delta phi represents the phase delay of the sound wave due to getting to the microphone and due to the electronics, x is the layer thickness and mu_s is the thermic path length.

A less n doped epitaxial layer on a strongly n+ doped Si wafer closely approximates the above model in the vicinity of a wavelength of 10 microns. Here, although the Si wafer will be strongly transparent, the absorbed

infrared radiation finally always produces the heat wave in the substrate. Then the heat wave which develops must follow a path depending on the layer thickness in order to get to the surface of the layer defined by the gas and develop a sound wave in the cell. According to our calculations the phase delay of the photoacoustic signal in this mode with a 1 kHz interruption frequency has a ratio to layer thickness of

[Formula 4]

The CO_2 laser is a light source with outstanding output at the 10 micron wavelength, and we can modulate its light directly through the power unit.

Figure 6 illustrates the measuring arrangement developed. We used the cell figuring in reference 1 (L. Kocsanyi, P. Richter and K. Kaffka, "Photoacoustic Spectroscopy and Its Use in Study of Foodstuffs," FINOMMECHANIKA-MIKROTECHNIKA, No 6-7, 1986) as the photoacoustic cell, with a Zn-Se window. We referred the phase measurement to 10 MHz clock signals. Figure 7 summarizes our results, illustrating the pulse number values obtained for a standard series. The measured results approximate from below the estaimated value, that is Delta psi over 1 micron is less than 1.4 degrees. The value lower than the theoretically obtained 1.4 degrees over one micron presumably derives from the fact that the absorption of the layer compared to that of the substrate cannot be entirely neglected.

Expression of Thanks
The authors express their appreciation to Ferenc Engard (BME), Dr Karoly Kaffka (KEKI [Central Foodstuffs Industry Research Institute]) and Dr Laszlo Nagy (TAKI [Telecommunications Research Institute]) for their help with the measurements and to Claus Buschmann (TU Karlsruhe) for help in using the spectroscope on biological samples.

FIGURE CAPTIONS

Figure 2. Schematic of the PAS block built at the Atomic Physics Faculty. 1. 450 W Xenon lamp; 2. lamp power unit; 3. condenser; 4. Jobin Yvon H20 monochromator; 5. light interrupter; 6 and 7. reference signal transmitters; 8. pyrodetector; 9. PAS cell; 10. Bruel and Kjaer condenser microphone; 11. B and K pre-amplifier; 12. Lock-in amplifier pair.

Figure 3. Normalized PAS spectrum of red pepper powder at f=22 Hz. (Normalization was necessary due to the variable spectrum of the Xenon lamp and the dispersion of the monochromator. The normalizing signal comes from the pyrodetector.)

Figure 4. PA spectrums of red pepper fruit (normalized): at 22 Hz (a), 88 Hz (b), 350 Hz (c) and 512 Hz (d).

Figure 5. Normalized PA spectrum of "peeled' red pepper at 350 Hz. (The spectrums in figures 4 and 5 are the result of joint research with the Botanical Institute of the Karlsruhe University.)

Figure 6. An arrangement to measure epitaxial layer thickness. (Mod. feny=modulated light; lezer=laser; tapegyseg=power unit; frekv. mero=frequency meter.)

Figure 7. Results of layer thickness measurement. We also show the error of measurement. (Elemeleti=theoretical; kiserleti=experimental; impulzus-szam=pulse number; retegvastagsag=layer thickness.)

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HUNGARY: TABLE OF CONTENTS OF MAGYAR ELEKTRONIKA

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1987 p 2

On Our Cover

On our cover can be seen a collection of the products of the Electric Industry Research Institute. Our picture tries to show the most characteristic and--not least of all--the most striking items out of a broad spectrum. The institute deals with many things--from solar elements through various power supply systems to airport lighting. The three articles published in this issue represent the chief directions of research and development work connected with electronics and the heavy current use of electronics. Naturally we could not strive for completeness in our collection; we only wanted to awake interest in a special area still handled rather unkindly but industrially very significant.

Heavy Current Electronics

In our heavy current electronics section we publish articles written by colleagues of the VKI [Electric Industry Research Institute]. Zoltan Vincze deals with development of an inverter for uninterrupted power supply systems. He describes the control requirements and the control circuits used by them. Laszlo Domok and Laszlo Sebestyen describe an example from the theme of computerized control technology. They control the drives of equipment prepared for fatigue tests of running gear with a microcomputer system. Power units are extraordinarily important in practice; they can be found in essentially all electronic equipment. The article by Gusztav Szlovik comes from this theme area; the author deals in his article with control technology questions for ultrasonic frequency switched mode power units.

Hobbytronics

Our hobbytronics column has gone to new hands in the editorial offices; we hope that this change will continue to increase the popularity of our column. We feel it our task to give help to those who have gotten beyond the initial difficulties--whether in programming or building apparatus--and are already capable of solving independent tasks. We will not deal with game, school or explicitly user programs, but we will welcome the ideas of those who can contribute to speeding up computers, making them more "clever," etc.

We await first of all reports from those dealing with IBM PC programming and hardware enhancement.

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HUNGARY: DATACOOP PRODUCES MISSING COMPONENTS

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1987 pp 3-4

[Interview with Ferenc Bindics, president of the Datacoop Small Cooperative]

[Text] [Question] Datacoop is now a small cooperative putting out a production value of 230 million with 30 people. This is a surprising achievement in Hungary. First of all we would like to know where this collective started from and how it got so far in a few years.

[Answer] The start was similar to that of Apple, only we began with a garage. We had a few ideas and a sum (92,000 forints) corresponding to two months' wages for the workers which had to be put in a deposit. Now the common property is around 40 million forints. In the beginning we invested all the money, we invested in every theme from which we hoped to get something within a year. The value of production went up like this: 16 million in 1982 (half a year), 57 million in 1983, 142 million in 1984 and 230 million in 1985. The high turnover comes from equipment with relatively high value. In the beginning we made the more modern semiconductor memories for ESZR [Uniform Computer Technology System] computers, to replace the ferrite memories; then we began manufacture of printers, and then of keyboards. We always manufacture products which are shortage items on the Hungarian and socialist markets. If a product--such as the printer, of which we have made about 2,500 so far--grows beyond the possibilities of the cooperative we pass the manufacture on; thus the BHG [Beloiannisz Communications Engineering Factory] has purchased the printer license. As part of our computer modernization program we developed the TAF [remote data processing] terminals. We remodeled Orion displays so they would be IBM compatible. If it is necessary to make it compatible we build control electronics into the processor. One of our coming products is the optical keyboard. Orion ships them to the Soviet Union, built into a system.

We have a number of cooperating partners; we have subassemblies manufactured where we find the free capacity for it. Even larger enterprises cannot build a complete vertical manufacturing system. But the development is with us. Last year we created a special group ["szakcsoport", a form of undertaking organizationally distinct from the small cooperative] with 25 people so we can perform a few essential tasks such as testing and alignment in-house; the special group also assembles the keyboards.

The profit portion of our activity is not bad in my opinion--20-25 percent without taxation. Some of the remainder goes to investment--about 15 million forints this year. Part can be distributed among the members, and something remains for social, advertising and other purposes. We can also give our members significant support for housing construction.

[Question] The dynamic of development is determined by the momentum which your developmental engineers dictate. How many are involved with development, and how can you provide the material rewards and the work conditions for this momentum? I think that the expertise and creativity of the engineers are not enough for this.

[Answer] Of the 30 people 18 have higher degrees; most of them are engineers but there are a few who graduated in technology and other subjects. Our office apparatus is very small. In addition to the usual tasks my secretary takes care of all of the administration of the cooperative. Three people, with a chief bookkeeper, do the bookkeeping and accounting, that is take care of economic matters. We have mechanized their work so even with this much business they can perform their tasks. (Let me note only in parentheses that our bills and invoices amount to as much as in a small enterprise.)

Compared to the Hungarian view of it I have a rather different opinion of development. First of all one must know the direction of the "blow"; one must know what the market needs, what will be needed here within about 2 years. We know this from world trends; the cooperation of the EMO [Elektromodul electronic parts trading enterprise] is a great help to us thanks to market research. The second thing development needs is a good idea. One cannot start development thinking that something may come out of it later. One must develop something for which there is already an idea. Then development can begin. Even one year is a long time from idea to manufacture; for us it is 0.5-1 year.

Our developers work in this medium, but one could imagine a more efficient setup. It would be good for us if we could get a team on contract, in addition to our own developers, for some theme. If we paid them we could get the best experts. They might solve the problem in 1-2 months instead of six. One could organize a new team, naturally, for a new theme. This would select the developers very well; there would not be, let us say, four or five out of every ten who actually just assist the other half of the team. For the time being I believe this is only a dream in Hungary, but this is the way of the future.

You asked about material rewards. I do not consider this the most significant factor for our developers--at least not in itself. Every developer here knows that next year the cooperative will manufacture what he is developing now. If the development fails there will be no income either, there simply won't be anything to pay out of. This is the chief incentive force; and it contributes to this that a good developer here can earn 1.5-2 times his pay--at an annual level--if his work is successful.

[Question] Permit the last question to be a rather personal one. You were chief of a computer technology main department of a state enterprise before the formation of the cooperative. With what idea did you start out and with the aid of what principles or methods did you achieve this development tempo? And not least of all, where next, can you develop with this momentum in the future?

[Answer] What you ask is the most difficult sort of question. I can hardly answer the last question, if only because this is a small cooperative and it cannot outgrow its own frameworks. In regard to the personal aspect I can tell you how we began.

We were a few friends or colleagues working in computer technology (some of us in responsible positions) who could not realize our ideas under the given conditions. We sought in the new forms of undertakings (economic work association, small cooperative) for one suiting us. We studied the regulations for a long time and found the small cooperative form satisfactory. We brought in a financial expert and a few engineers, technicians and instrument makers. We promised that if the undertaking succeeded they might earn even twice their present pay; if not they could go wherever they wanted. And we put our livelihood on one card. So the small cooperative was formed with 15 people. I have already told the rest.

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HUNGARY: COMPUTER CONTROLLED DIRECT CURRENT DRIVE SYSTEM

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1987 pp 19-22

[Article by Laszlo Domok and Laszlo Sebestyen: "Direct Current Drive System With Computer Control"]

[Text] A microcomputer well adapted to an industrial environment is suitable for performing highly complex, multi-parameter, long-time tasks. By developing digital control the industrial processes can be made more precise and can be kept better in hand. Such services greatly facilitate the tasks of operators and operation can be mastered simply. Use of a microcomputer also makes use of heavy current equipment simpler.

The Closed System Running Gear Tester

Control of equipment involving several electric drives and maintaining contact with the operators makes necessary use of a highly intelligent computer guidance system. We prepared for the Hungarian Car and Machine Factory in Gyor microcomputer equipment to control the direct current drives of a test bench suitable for fatigue tests of mechanical units.

Mechanical Structure of the Equipment

The purpose of the equipment is to test the life expectancy of differentials and running gear of heavy highway vehicles. We produce various load conditions during the life expectancy test and measure the amount of wear after fatigue cycles of a given time. Naturally it is also necessary to record fractures arising during the wear and the conditions producing them. We test two differentials at once during the test. The two differentials are connected mechanically through cog-wheel drives in such a way that the two differentials and the drives make up a closed system. If we create stress causing torsion in this closed system then both differentials are subjected to a load of a constant character. Thus as the differentials turn we can achieve a load or overload condition corresponding to operational conditions as a result of the stress load. There are two electric driving motors in the system. One (the main motor) does the turning and takes care of the friction or speed change work in the system. The other (the forcing motor) serves to introduce the torsion stress, through a transmission; with its aid we can "twist" the axles of the differentials relative to one another. The mechanical structure is such that the stress put into the system is proportional to the time integral of the rpm difference of the main and forcing motors.

Three chief quantities characterize the load cycle during the tests:

1. the rpm of the system;
2. the stress locked into the system; and
3. the duration of the load condition.

The speed of rotation of the system is determined unambiguously by the rpm of the main motor. The stress locked into the system is measured by various stress transmitters located on the axles and selected by the user, and the rpm of the forcing motor must be changed as a function of the measured value.

Electrical Structure of the Equipment

The main motor of the equipment is a 212 kW direct current motor with a nominal rpm of 1,100. The forcing motor is a 16 kW direct current motor with a nominal rpm of 1,500. The direct current motors are powered by separate regulated thyristor power units. The power units are independent electric drives with rpm controls. Since the integral of the rpm difference of the two motors in the system changes the stress locked in a precise control of the speed of rotation, that is of the stress, is essential. The drives, operating with analog control, have a precision of one percent relative to the nominal rpm. This precision in itself is not sufficient, so we supplemented the two drives with a stress regulator.

The drives can have two main operating states--manual operation and automatic control.

In the manual operation mode the drives can run separately or together. The purpose of this mode is performance of possible operational tests and to provide the possibility of direct operator intervention. Figure 1 shows the two drives and the manual operating console.

Digital control has a number of advantages. In the control cycle there is a fast operating digital rpm and stress regulator above the analog rpm regulator. Its purpose, using the more precise digital measurement of rpm and stress values, is to hold at the lowest possible level the harmful stress swings deriving from the integration of measurement error. The programability of the test cycles is the other crucial argument for using a computer.

The Microcomputer Control Unit

Connecting a microcomputer to the two drive regulator cabinets makes possible automatic, long-time tests. In addition to feeding in the test program the task of the operating personnel is limited to the role of observer during operations.

The microcomputer is suitable for the running of so-called block program fatigue tests. This means the following. An entire test program repeats cyclically, and consists of a maximum of 99 blocks. A maximum of 30 so-called program steps can be programmed within one block. Within a program step the rpm and stress of the system are constant. Figure 2 illustrates a possible formation of program characteristics.

The figure gives an example of a possible variation of the most important characteristics of a program block consisting of ten program steps. For the sake of simplicity the times of the program steps in the example coincide. In reality a program step can have an arbitrary value in the range of one to 3,000 minutes, with a resolution of one minute, depending on the programming. Like the time of the program step, the chief characteristics within a program step (rpm, stress) are programmed values; the number of steps within a block to be run and the number of program blocks can be varied within wide limits, giving the possibility of a large number of program variations.

Developing such a complex system with so many degrees of freedom also necessitates computerized program control, so in addition to improving the above mentioned precision parameters this is another argument for using a microcomputer.

Development of the Microcomputer Drive System

Figure 3 illustrates the connection of the direct current drives and the microcomputer into a uniform system. Digital rpm sensors on the ends of the axles transform the controlled characteristics of the main motor and forcing motor drives, rpm's F1 and F2, into a sequence of TTL level pulses for the microcomputer. From these sequences of pulses the computer determines the rpm of the motors with great precision and with the aid of digital PI algorithm and a D/A transformer it sends digitally controlled base signals, A1 and A2, to the drives so that the precision of the regulated system is better by an order of magnitude than that provided by the analog regulator. This maintaining of stress has an important role. A stress transmitter serving to sense the stress awakened in the system is connected to the drive of the forcing motor; its analog voltage output signal (N) appears, through the A/D converter of the computer and its digital control, as the control signal for the A2 rpm base signal in the control loops. While running the program the computer also watches the output signal of a temperature sensor (T) located at a spot characterizing the operational state of the system. The PU1 and PU2 "console operation ready" signals indicate to the drives that a valid, runable program is in the computer. Switching the drives from manual to automatic operation is possible only if these signals are present. In the event of any irregular operation or failure these signals cease and the driving stops. The SZU1 and SZU2 signals serve a similar function; they signal the computer concerning the operational or faulty status of the drives.

Internal Structure of the Microcomputer

Considering that the drive and the microcomputer are located in an industrial environment where one can count on strong vibration and grid disturbances the microcomputer is so made that the system is insensitive to these disturbances. Because of the sensitivity to mechanical vibrations a magnetic disk store could not be considered as background storage for the test programs. The solution was conversion of a good quality cassette data store, which could be remote controlled and thus operated via software too, into an "intelligent" background store. A table of contents at the beginning of the program cassette stores the programs on the tape, which the operator can list out and, after selection of the appropriate program, the computer automatically begins to look for it.

The power unit of the equipment, the black-white monitor, the cassette data store and the card system of the microcomputer are placed in a common metal box providing good electromagnetic interference filtering. The keyboard serving to program the device and the matrix line printer recording the measurement results are separate units. An LC filter keeps disturbances coming over the grid away from the equipment. The elements requiring grid power (the cassette data store, the monitor and the line printer) receive this filtered grid power. The internal power unit of the device also supplies power to the digital rpm sensors.

The card system of the microcomputer is based on elements of the Z80 microprocessor family. The modular structure makes possible fast checking and repair and offers a possibility for further development.

In addition to the basics (CPU, EPROM, RAM cards) we also made special cards. In the interest of achieving the necessary precision for analog signals we connected 12 bit resolution A/D and D/A cards to the computer. A separate "TAPE INTERFACE" card takes care of every function for the cassette background store.

The indicator lines, the pulses of the rpm sensors, the parallel information of the keyboard and line printer, and the signal of the temperature transmitter are received by a special peripheral card handling serial and parallel lines.

Programming and Operation of the Microcomputer

The characteristics of the desired test program can be programmed individually or the desired program can be read into the device from the cassette background store. After programming or reading in the parameters the characteristics of the given program block appear in tabular form on the monitor; then it is possible for the operator to modify and store a new or changed program. After starting the program the test characteristics put in and their measured values appear in tabular form on the monitor of the computer.

When the test program is completed the measurement results are recorded on the line printer. The recording includes the parameters identifying the test program, the testing time run and comments connected with the measurement. If during measurement any of the tested characteristics exceed operational conditions (e.g., a stress jump due to a fracture, overheating, etc.) the computer generates an emergency shutdown and prepares a so-called "post mortem" report in tabular, printed form. This report contains the status of the tested characteristics during shutdown and the states preceding the emergency shutdown going back a maximum of 10 minutes with a 0.5 second sampling time. A flowchart of the program of the computer can be seen in Figure 4.

Since very long measurement times do occur it must be reckoned that a chance power failure could happen while the program is running, but despite this one must ensure the operability of the equipment. In the event of a short duration power failure (max. 1 hour) the driving stops but the computer preserves the data in battery operation and when power returns the measurement can continue from the state preceding the failure, upon which the operator authorizes a restart of the drives.

Autobiographic Notes

Laszlo Domok. I was born in Budapest in 1956. In 1980 I obtained my electrical engineering diploma at the Electrical Engineering School of the Budapest Technical University, in mechanization and automation. Since 1980 I have worked as a scientific colleague in the electric drives and control technology main department of the Electric Industry Research Institute. My professional work extends to analog and digital control technology and computer equipment.

Laszlo Sebestyen. I was born in Sopron in 1955. In 1978 I obtained my electrical engineering diploma at the Electrical Engineering School of the Budapest Technical University. Since 1978 I have been a scientific colleague in the electric drives and control technology main department of the Electric Industry Research Institute. In 1984 I won the title of technical doctor in power electronics. My professional work extends to power electronics equipment, control technology and digital control.

FIGURE CAPTIONS

1. p 20. Drive cabinets with manual operator's console (photograph).

2. p 20. Example of possible setting of program characteristics.

3. p 20. Diagram of the microcomputer drive system.

4. p 22. Flowchart of the program of the microcomputer.

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HUNGARY: SPECIAL MAGNETIC DISK COUPLER FOR GEOPHYSICAL APPLICATIONS

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1987 pp 33-36

[Article by Tibor Bisztricsany, Janos Varga and Ference Kereszti: "Special Coupler for Magnetic Disk Store"]

[Text] A Review of Magnetic Disk Stores
Various types of magnetic disk stores are used in computer technology. Each of them has its advantages, but they also have unfavorable properties. We cannot rank them according to quality because use of different types is useful depending on the tasks to be solved with a computer. A properly chosen magnetic disk store makes possible optimal utilization of a computer.

Exchangeable Disk Stores
With this type the magnetic disk (or a number of disks connected to one another on a common axis) can be lifted out of the drive unit itself. By exchanging disks the amount of data which can be recorded is unlimited. Information recorded earlier can be reused at any time.

Positioning on the disk is done by an arm moving in the direction of the center of the disk. Operational speed decreases significantly because of this, especially if the disk areas to be attended to one after another are far from one another.

Fixed Head Magnetic Disk Stores
In this case the magnetic disk is built into the drive unit; operating personnel cannot get at it physically. The heads providing data transfer are fixed. There is a head for every band of the disk, so it is enough to manage by electronic means those needed by us; in this way they become operational in a very short time.

Winchester Type Magnetic Disk Stores
The disk (or disks connected to one another on a common axis) cannot be exchanged. The sensing heads move, not in a radial direction but rather along arcs fitted to the arm, as it turns. Positioning is faster with this solution than in the case of exchangeable disk stores but slower than with fixed head stores. At this time this solution is the most modern. Magnetic disk stores with the greatest data density are made in this category.

Floppy Disk Stores
Although in this case the data carrier is a magnetic disk they serve to replace punch card and punch tape in regard to their use areas. Floppy disks can be handled easily, but because of their relatively small capacity they are suitable for storing only tests and simpler programs. Their advantage, as opposed to puch cards and punch tape, is that data input and output are done by the same unit.

The Fixed Head Magnetic Disk Store
In the case of geophysical processing it is necessary to sort a very large quantity of data in a short time, so use of a fixed head magnetic disk store is unavoidable. Speed is a factor in every case when performing certain operations. In realtime maritime systems, where the speed of the surveying ship has a lower limit (otherwise the cable suspending the sensors will not stream in the water), a longer processing time would not make possible a study of measurement points with sufficient density.

In our case the sorting of data is accompanied by frequent positioning on the magnetic disk. By eliminating the mechanical movement of the sensing heads the average access time is shortest with fixed head stores. Earlier we used the MOM [Hungarian Optical Works] DISCMOM type 800 K byte capacity store, but since the appearance of the Videoton R-11 computer we have been working with a MOM DM 2.5 type 2.5 M byte capacity magnetic disk store in which both sides of a hard disk are used for information recording. Its chief characteristics are the following:

Revolution speed--3,000 rpm;
Time of one revolution, 20 ms;
Average access time, 10 ms;
Transmission frequency, 3.9 MHz; and
Maximum capacity, 20 M bytes.

One can consider 256 bands from the viewpoint of information. The 256 bands are divided up among 8 zones. Each zone contains 32 bands. Each band is divided into 32 sectors. The number of information words within each sector is 128. A word is made up of 16 bits. (See Figure 1.)

In addition to the 256 addressable bands the disk contains 32 reserve bands. These come into play with the failure of any basic band; by rewriting the microprogram a reserve band takes the place of an injured band in such a way that the earlier addressing mode of the disk is not influenced.

In addition to the total of 288 information bands one can find on the disk a 1+1 optional clock band which the factory will write up at the special request of the customer if the usual distribution does not suit him.

Data transmission is serial, so one line serves for writing data in and another for writing it out. The smallest addressable part of a disk is the sector; it is not possible to transmit information shorter than 128 words. If this should be necessary then the unused part of the sector must be filled with zeros so that the parity word generated to check by sectors will be correct.

Data Traffic

The microprocessor controlled "multicommandos" coupler of the Videoton 6800 takes care of data transmission between the fixed head magnetic disk store and the memory of the R-11 computer.

Writing to Disk

The reading of information, starting from the memory address given, begins after fetching and storing the command block. We write the data to the temporary memory of the coupler. The coupler then issues the write authorizing signal when the addressed sector is reached during the revolution of the disk. We read the first word from the temporary memory and the data goes through the parallel-serial transformer to the write line of the magnetic disk store where, with the aid of a pacing signal, it is recorded in serial form bit by bit on the disk. We generate length parity for every 128 words and write this 16 bit information to disk as the 129th word of every sector.

After the entire data block has been written (earlier in event of error) we request an interrupt and complete the data traffic by issuing a status word indicating the cause.

Reading from Disk

After fetching and storing the command block we wait until we reach the addressed sector during the revolution of the disk. We then issue the read authorizing signal, upon which the information recorded in the given sector earlier goes bit by bit to the read line at a rate corresponding to the clock signal of the store. The coupler writes the data to temporary memory word by word through the serial-parallel transformer, from which it goes into the memory of the computer. In this case also we generate length parity for every 128 words but we do not write this 129th word to memory, rather we compare it to the 129th word found on disk. If the length parities generated during writing and reading do not coincide then the coupler indicates a parity error. After reading in the entire data block (earlier in event of error) we request an interrupt and complete the data traffic by issuing a status word indicating the cause.

The Special Coupler

During geophysical measurements we send waves into the deep by generating artificial vibrations (e.g. with an explosion). We receive the returning waves with sensors (geophone, hydrophone) located at the same distance from one another and connected by a cable. After amplification and digitization the data collecting equipment either records them on magnetic tape or writes them to the memory of the computer (realtime mode). We generate the vibrations at a number of places along the extended cable and in very case we note the signals received by all the sensors. On the magnetic tape (or in the memory) the data received by all the sensors after the generation of a vibration will be side by side (as many data as sensors). But when processing we need all the data received by individual sensors, so we must resort the block in such a way that all the data received by individual sensors should be side by side (channel continuous format). We perform this operation when sending the data to magnetic disk store, so it does not require separate time. In the interest of this a non-continuous addressing mode must be made possible in addressing both

the memory and the magnetic disk. To do this we redesigned the already mentioned Videoton coupler and supplemented it in such a way that control remained unchanged but the addressing of memory and disk can be programmed (Figure 2).

The special operating modes are:

--Band jump (in a 1-31 range),
--Single word memory jump (in a 1-255 range), and
--Two word memory jump (in a 2-255 range).

Band Jump Mode
Addressing memory takes place in the normal way, in continuous write-read operation; that is, we increase the memory address by one after transmission of every line.

We store the initial address of the disk in registers. We also store the magnitude of the band jump, which can be given by the program, in a register (5 bits). The initial address of the disk determines the first sector needed for data transmission. In a normal case, after completion of the first sector, we go automatically to the next, as derived from the turning of the disk. But in band jump operation we increase the band address after every sector in the way designated in the program. Since we are using a fixed head store the shift to another band does not require mechanical movement so the time between the useful parts of two successive sectors is sufficient for the addressing of a new band. Here also the addresses of the sectors considered one after another increase by one, but not within the same band (Figure 3).

Sorting the data in this way by sector can be done with a normal coupler too, but then, before transmitting every sector, the command block has to be given again and an interrupt must be requested at the end of the sector. With these extra instructions we run out of the time available between two sectors, so we must wait for a complete revolution of the disk, which represents a time loss of 20 ms for every single sector.

Single Word Memory Jump Mode
Addressing the disk takes place in the normal way as in the case of continuous writing-reading; that is, we increase the sector address by one after every transmitted sector. We write the beginning memory address in three cycles to a 20 bit register. In the fourth cycle we store the magnitude of the memory jump in an 8 bit register.

We give the beginning memory address to transmit the first word. This is the first word of the first sector. While the data exchange is taking place we reset the address by the amount of increase given in the program. We continue stepping until the handling of one sector of data is completed. Then we return to the beginning memory address and, increasing it by one, we bring over the first word of the second sector. We then again perform stepping by jumps according to the program until we reach the end of the sector. Then we turn again to the front of memory; now we increase the address of the first word of the second sector by one, and so forth. We perform the operation until all the data of the entire block have been sorted (Figure 4).

Two Word Memory Jump Mode
We proceed similarly as in the case of the single word memory jump mode, with the difference that we are managing double words (32 bits).

For the first word we consider the beginning memory address. This will be the first word of the first sector. Then we step the memory address higher by one and bring over the second word. For the third word we increase the existing address by 2n-1, where n is the magnitude of the memory jump given in the program. The fourth word will be in the place higher by one compared to this address. We perform this relay memory stepping until we have brought over one sector of data. Then we return to the beginning memory address and, increasing it by two, we get the address of the first word of the second sector. We perform the data transmission from here until the end of the sector, jumping by values of 1 and 2n-1 respectively. To get the first word of the third sector we must increase the address of the first word of the second sector by two, and so forth (Figure 5).

Realization
We expanded the microprogram on the two card (DP50-03, DP50-01) coupler of Videoton and made a few simple modifications which did not require replacement of parts. Jump addressing is done by a third card which is connected to the two cards mentioned by a multiplaquette and interface cable.

Development of the special coupler was made necessary by the fast sorting of the very large data blocks customary in geophysics, but it could be used successfully in other areas if similar needs arise.

Autobiographic Notes
Tibor Bisztricsany. I was born in Budapest on 12 February 1953. I graduated from the Transportation and Telecommunications Technical College in 1974 as a factory engineer. I went to my first and present job at the Hungarian State Lorand Eotvos Geophysics Institute on 2 September 1974. In February 1975 I was called up for military service. After my discharge I took part in aligning a magnetic tape unit developed at the institute. A little later I transferred to the group dealing with R10 DMA interfaces. My task was coupling a fixed head disk operating with demultiplex addressing. Later I dealt with other couplers too. I participated regularly in installation abroad. At present I am dealing with memory development. I am married and like to spend my free time with my wife and children.

Janos Varga. I graduated from the computer technology section of the Weak Current School of the Kando Kalman Electrical Industry Technical College in 1972 as a factory engineer. I went to my first and present job at the Videoton Developmental Institute on 1 September 1972. At first I participated in coupling work on the VT 340 display for the MITRA 15 computer then being adopted. In 1973 I was called up for 2 years military service. After my discharge I returned to the group developing the VT 1005 machine. After the first theme was concluded I was responsible for adapting and redesigning couplers for exchangeable disks (10-50 M byte) for the R 11 computer. In the years which followed I participated in installation of the first fixed disk systems sold to the Soviet Union, in Moscow. From 1983 until November 1986 I

worked as the R 11 group chief in the Moscow Customer Service offices of Videoton. At present I work at the Videoton Developmental Institute on a job connected with the VIDICOP system.

FIGURE CAPTIONS

1. p 34. The divisions of a disk.

2. p 34. The place of the magnetic disk store coupler in the computer.

3. p 35. Example of the band jump operating mode (value of band jump is 2).

4. p 35. Example of the single word memory jump operating mode (magnitude of the memory jump is 8).

5. p 36. Example of the two word memory jump operating mode (magnitude of the memory jump is 8).

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HUNGARY: TELEKABEL, COMPUTEXT PRODUCE SATELLITE PROGRAM RECEIVERS

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1987 p 61

[Text] Interview With Peter Kiss, President of Telekabel Small Cooperative
[Question] Many see considerable business in the near future in artificial satellite reception technology. We would like to know the plans of Telekabel (more popularly known by its trademark, Mini-Max). Please give a briefing for our journal!

[Answer] We were the first in Hungary to deal with satellite TV reception. First we received transmissions with a combination made up of mixed Western equipment. Our first live demonstration was 2 years ago. At the request of the OMFB [National Technical Development Committee] we began our own development. The set-up shown at the spring Budapest International Fair in 1986 already worked with this.

We manufacture small antennas, with diameters of 1.2 to 3 meters, out of fiberglass reinforced plastic, but development is about complete of our 1.4 meter exploded antenna made out of aluminum. This is intended primarily for Western export for the ECS satellites, but it will be suitable for receiving the DBS satellites in Hungary also. We manufacture interior units only for communal systems.

Whether there will be business in Hungary for artificial satellite reception depends primarily on higher level decisions. We can deliver complete systems for the DBS satellites at any time, we are prepared technically.

Computext Manufactures Equipment to Receive Broadcast Satellites
Computext is an instrument and computer technology development enterprise which is one of the legal successors of the former Textile Industry Research Institute. The chief profile of the 200 employee enterprise is development and manufacture of textile industry instruments and textile industry applications of computer technology.

The microwave laboratory of the enterprise--under the leadership of Erno Gardai--has developed satellite reception equipment, antennas, converters, individual interior units and communal equipment and it has achieved success abroad. It is counting on serious orders in the first half of 1987, primarily from CEMA countries. They are also preparing for the competition shortly to

develop on the domestic market, which can be expected after the appearance of the French and West German direct broadcasting system (DBS) satellites which will also reach our country. So Computext has decided that as long as the satellites are not up it will not sell equipment. Their caution is justified because it is not impossible that at the last minute the satellite owners will make modifications which will require minor modification of the present equipment. (On the one hand the Hungarian Post Office will not issue a reception permit for the present satellites and on the other hand the coded transmissions can be received--in an enjoyable form--only by owners of decoders who pay for the programs.)

They make their antennas out of plastic in diameters of 0.6-3 meters, with aluminum or steel frames. They are precisely formed, light yet very strong; they outstandingly resist vibrations (e.g., wind). Their exterior units (converters) were developed to receive both ECS and DBS satellites and are made in single and double polarization versions. The interior units (these produce the amplitude modulated signal for ordinary television sets) are composed of modules for private and communal systems. They also developed two instruments to aid alignment and repairs. They can ship the desired combination within 3-6 months depending on the requirements. Our readers can find their assortment list in the middle of our journal.

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HUNGARY: CAD SYSTEM OF MACHINE INDUSTRY R&D SUBSIDIARY

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1987 p 62

[Text] One of the most widespread applications of CAD systems is aiding machine industry designing work. Developers of modern designing stations are already working on three-dimensional displays; preparation of sections and documentation is already solved even for completely unique surfaces. These systems have one essential defect, they are expensive.

Practicing machine industry designers frequently solve routine tasks which do not really require the level of designing for which large CAD systems were developed. It is enough to remember that a system consisting of containers, etc.--even an entire plant--could be designed of elements already well proven in practice which can be found in standards or books. Naturally this includes those scaling computations which sometimes are clumsy to solve in the traditional way. For this one could use today a professional personal computer--corresponding to the level of the given task. The other problem is documentation. This means primarily scaled drawings on the basis of which the product can be made. In similar tasks where a figure occurs n times one must draw it n times. This is tiring, expensive, time consuming and in a certain sense superfluous.

The developers at the Machine Industry Research and Development Subsidiary of the April Fourth Machine Industry Works sought a solution to these problems. Their quasi-CAD system called SONG-FOL offers aid expressly for those routine tasks which contain frequently repeated design and scaling tasks. The basis is provided by folios containing various figures which are not yet scaled. A blueprint can be prepared quickly from these even with completely manual designing--sticking the several elements to the back of the drawing paper. Scaling is aided by the C-SONG-FOL program package--developed for an IBM compatible computer--with which containers, pressure vessels, pipes, metal structures, etc. can be scaled. They are now developing program packages prepared for construction industry and power plant applications of axles, cogwheels and drives.

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HUNGARY: TUNGSRAM'S BETA ROBOT

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1987 p 62

[Text] The Gyongyos Semiconductor and Machine Factory of the EIVRT [United Incandescent Lamp and Electrical Company, also known as Tungsram] had been dealing with the manufacture of robots and manipulators for years. In 1982, as the result of a government decision, the factory was transferred to the Microelectronics Enterprise. Tungsram also continues to deal with the development of robot controls.

In 1983 they formed an electronics development main department to develop modern electronic equipment, indluding robot controls, and start series manufacture. Within the framework of cooperation with the Soviet auto industry they began manufacture of the so-called "Beta-robot." The Beta-robot is a six axis, articulated, point controlled, highly reliable robot with a load tolerance of 60 kilograms. Its chief use areas are point welding of car bodies, auto industry assembly and reloading. The main department developed electronic robot controls, the heavy current unit and a microcomputer welding current control unit and also participates in series manufacture. The controls, developed over 2 years, were made in two prototypes--on a CEMA element base within the limits of possibility. They were tested by 2,000 hours of continuous fault free test operation and completely satisfied the requirements. They also operate perfectly in the Soviet Union. Series manufacture has begun, on a Soviet order for 1,050 units. The first 70 units will be shipped by the end of the first quarter of 1987.

Additional developmental plans are:

--development of a heavy current cabinet for the Beta-robot,
--development of prototypes of the welding control electronics,
--making the control unit suitable for control of an arc welding robot,
--developing the next generation,
--adapting the highly reliable subassemblies being manufactured in series to machines being manufactured or planned for manufacture in Hungary, and
--developing a technical service to spread the robots received from the Soviet Union and creating model systems in Hungary.

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POLISH, EAST GERMAN S&T CONFERENCE IN RYDZYNA, POLAND

Interview with Polish Participants

East Berlin FEINGERAETETECHNIK in German No 2, 1987, pp 86-87

[Interview with P. Ostaszewicz, doctor of economics, deputy director of the Warsaw Institute for Organization in Mechanical Engineering, and Dr Samujllo, instructor and deputy director of the Institute for Social Sciences, Organization and Management of the Zielona Gora Engineering College, by editor D. Ender]

[Text] The following is an interview with Polish participants in the conference "Rydzyna '86" on benefits of and possibilities for cooperative relations.

From 24 to 26 September 1986, about 80 representatives of enterprises and research institutions from the Polish People's Republic and the GDR meeting in Rydzyna discussed improvements in and effects of scientific-technical cooperation between the two countries. This topic is of interest to many readers of our journal, which was reason enough for our participation at this conference.

In doing so we hoped to learn what specific forms this cooperation could assume in the future, and what notions our Polish partners entertain about such a cooperation.

Therefore we asked Dr Ostaszewicz, deputy director of the Warsaw Institute for Organization in Mechanical Engineering, and Dr Samujllo, instructor and deputy director of the Institute for Social Sciences, Organization, and Management of the Zielona Gora Engineering College, to answer some questions we had in this connection.

[Question] Dr Ostaszewicz, industry and various research institutions in Poland are using this conference to make cooperation proposals to enterprises and research institutions in the GDR. What advantage do you see for the two partners in such cooperative work?

[Answer] First I must say that nowadays research and development are very elaborate and costly activities. Relatively small countries such as the GDR and the Polish People's Republic must cooperate if only for economic reasons. This includes the desideratum that these countries specialize in certain

scientific-technical areas. The joint work based on this and the associated exchange of results decrease the load on cadres and scientific equipment. We have found these things to be true once again very recently in our cooperation with the USSR in the area of television sets, which has gone as far as the joint development and production of new types of TV sets. But also already existing cooperative relations between the GDR and our republic could be strengthened further, for example through new forms of organization, ranging from joint research centers to the joint enterprise. For example, up to now only one jointly managed weaving-mill enterprise exists.

[Question] Can you be more specific about what you just said?

[Answer] Already effected joint projects have brought with them a noticeable shortening of development times and times needed for introduction into production. Simultaneously, the wealth of experiences on both sides has grown, which has created favorable prerequisites for new projects. Also the human contacts that are generated should not be underestimated; such a friendship among colleagues of the two nationalities grows up, so to speak, within the working process. But the economic benefit is immediately endangered if certain prerequisites for the cooperation of the two partners are not heeded. For one thing, the financial and material expenditure must not fall below a certain magnitude if the gain from the joint result is not to be jeopardized. This is true, for example, of the financing for joint servicing in third countries. Secondly, both countries ought to be the sales outlet for the jointly developed product itself and also should carry out together the activity of exporting to third countries.

[Question] Dr Samujllo, the topic of your conference paper was on the forms and effects of cooperation between Polish enterprises and research institutions and corresponding institutions in the GDR. Would you please give to our readers examples of where and how such a cooperation brings about greater results specifically in the scientific-technical sector?

[Answer] It is difficult to measure the technical-scientific effects. A growth in effects may become perceptible and in some way also quantifiable only when, for example, as a result of this licenses are awarded or the highest level of international standards has been achieved. On the other hand there are also effects that become apparent from a cooperative effort in any case. These are: Firstly, a joint standardization, and on this basis the possibility of exchanges of products. Secondly, the division of labor on a partnership basis in the designing, development, and manufacturing of products. Thirdly, the mutually reached level of knowledge and wealth of experiences arising from a joint production after a certain period of production. Fourthly, becoming acquainted with manufacturing and organizational systems of the partner as well as the exchanging or selling, for example, of control software or documentations of these technologies and organizational systems.

[Question] But surely it is not only results in the sector of science and technology that are produced--certainly also resistance must be overcome?

[Answer] I agree with you. Only this resistance is grounded above all in the motives of individual members of the engineering personnel. Thus, at present the design engineer is given patents or bonuses only on the basis of his own solving of design problems, but not on the basis of a successful introducing of time-tested solutions from another country. This situation ought to be changed by giving rewards consistently based on performance--that is, rewards favoring a cooperative attitude on the part of the personnel.

[Question] Mr Ostaszewicz, can you mention for the readers of our journal those groups of products for which you expect an increased cooperation with GDR enterprises?

[Answer] In our economy, specific areas and developmental trends have been promoted on a long-term basis, and these represent our contribution to this cooperation. In detail, these would be: The use of microelectronics in industry, automation and robot technology (with special emphasis on the organization of work stations for industrial robots), biotechnology, nuclear-power engineering, the recovery of new materials, and the introduction of light waveguide engineering. At present our largest financial resources are invested in these areas. Of course, cooperative efforts are also possible in other sectors of the economy. But in conclusion let me say something more about the organization of such cooperative efforts. In the past, the differing management systems have proved to be an obstacle to cooperation between our two countries. Negotiations between a combine management on the one side and an enterprise on the other are inauspicious, and for the most part the benefit achieved falls short of the expectations on both sides. On the Polish side, works managers also make relatively free decisions about the establishment of cooperative relations. On that point I would like to cite the most recent example, the concluding of a framework agreement between the ministries of machine-building of the USSR and the Polish People's Republic. According to this, on each side about 80 enterprises suitable for cooperation may cooperate to any extent desired with roughly the same number on the other side. This freedom of action has made itself felt particularly in a shortening of development and production times. We hope that a similar agreement can be reached also with the GDR.

[Question] The editors thank you very warmly for your comprehensive answers.

Results of Conference

East Berlin FEINGERAETETECHNIK in German No 2, 1987, pp 87, 88

[Article by Dr Wrobel and Dr Robak of the Zielona Gora Technical College: "Rydzyna '86--Exchange of Experiences on Scientific-technical Cooperation between the Enterprises and Research Institutions of Polish and GDR Industry and on the Computer-assisted Preparation for and Execution of Production"]

[Text] The site for holding this conference, which took place in the period from 24 to 26 September 1986, was the "Center for Technical Progress" of the Association of Polish Mechanical Engineers (SIMP) at Rydzyna near Leszno, a palace that has been renovated for conference-holding and instructional purposes. Rydzyna Palace was built in 1409, and after that it played a

significant role as the place of residence of Polish kings and other notables of Polish history. This palace, which was rebuilt in the style of the times in the 18th century and was destroyed in World War II, is approaching completion of restoration now as the SIMP Center.

The conference was organized by the Warsaw Institute for Organization in Mechanical Engineering and the "Juri Gagarin" Engineering College of Zielona Gora (Institute for Social Sciences, Organization, and Management). About 80 representatives of colleges, research and development institutions, and industrial enterprises from Poland and the GDR participated in the conference.

In addition to the plenary-session papers read in the Great Ballroom of the palace on the two sets of problems "Scientific-technical Cooperation Among Enterprises and Research Institutions" and "Computer-assisted Preparation for and Execution of Production," a series of papers on these themes were also presented in two separate sections in different instruction rooms. Four plenary-session papers were read concerning the first-mentioned theme. The three Polish speakers used this opportunity to explain the organizational changes in the planning and coordinating of scientific-technical cooperation that were established in Poland following the economic reform of 1981, in order to assess the possible reciprocal exchange of goods along with its trends and to present basic forms of cooperation for achieving economic and scientific-technical results.

Speaking on the second set of problems were, among others, Dr Mattern (Erfurt Metal-forming Combine VEB) and Prof Huelsenberg (Ilmenau Technical College)/Dr Wrobel (Zielona Gora Engineering College). Dr Mattern prefaced his plenary-session paper "Use of the Graphic Conversational Mode in Welding Technology" with a short color film that demonstrated very clearly by the example of his own combine the problems and tasks required in developing new products in the mechanical-engineering enterprise by the use of CAD/CAM solutions. In his exposition, the speaker also dealt with a series of other special problems (such as questions of work input, management, the data base, personnel encouragement, qualifications) in the implementation of this key technology.

In their paper, Prof Dr Huelsenberg/Dr Wrobel dealt with the choosing of CAD systems. In addition to a catalog of characteristic features in the technical analysis of CAD systems, among other things also a catalog of criteria for selecting CAD systems was explained.

1. Section "Scientific-technical Cooperation Among Enterprises and Research Institutions"

The discussions in this section concentrated on three chief problems:

* Ways for improving the organization and implementation of scientific-technical cooperation

* Possible forms of working together among research and development institutions and industrial enterprises from the two countries

* ways of encouraging the scientific-technical personnel of such institutions in carrying out these cooperative projects.

The representatives of the industrial enterprises brought into the discussion many interesting experiences from their cooperative work. From the papers, the following conclusions can be drawn:

* A well-organized cooperation is advantageous for both partners and leads, among other things, to the following effects:

- A reduction in the work hours spent on projects

- a raising of the technical level of the production process and the quality of products

* A further development of cooperation is possible through:

- a joint defining of research topics by the partners

- making resources available to the partners for the execution of such cooperation via certain financial funds.

* The "deficient" picture of the potential partner can be viewed as a substantial obstacle to improving cooperation; this picture becomes more objective through

- an analysis of the principles and forms of interaction between science and industry in the partner country, and

- the setting up of data banks with information about the newest solutions in the areas of research and development achieved by the partner.

2. Section "Computer-aided Preparation for and Execution of Production"

In this section, the level of CAD/CAM technology reached and proposals for solutions in this technology were discussed in particular.

For example, Dr Hesse (Robotron-Office Machine Works of Soemmerda, VEB) presented in his paper a computer-assisted process-control and informational system (FLIS) now in the stage of conversion into production. In this connection he emphasized that for the computer network now existing and being expanded further, primarily the personal computers PC 1715 of his own enterprise are being used. He stated further that the FLIS serves the primary purposes of strengthening the executive functions of the production director through the consolidation of all important data in the DAPL (work-station computer of the production director), of needs-oriented job scheduling, of a prompt plan fulfillment analysis, and of the nonredundant storage of all process data. Graduate Engineer Adamski (WSK PZL Mielec) presented an expanded version of a modularly constructed graphic system, which permits above all the designing of the outside and inside geometry of aircraft, but also can be used for designing outside and inside structures of other products (for example, in automobile and ship building).

All the papers, including those not presented here, were also available in a more detailed written form; these were handed out to the participants as conference material, either in the Polish or the German language.

It was established in the assessment of the conference that the results of the presented research work ought to be introduced into teaching at the colleges and in the further training of industrial cadres. The scientific work on the integration of production preparation and execution should be further accelerated, since this is a crucial prerequisite for the designing of efficient CIM solutions. Therefore it was also proposed that the next conference should be geared to the topic "Integrated Systems of Production Preparation and Execution."

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